

A PROGRAM OF FISH MANAGEMENT FOR THE ROOSEVELT
NATIONAL FOREST

C. N. Feast

Seaman LC
UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

A PROGRAM OF FISH MANAGEMENT

FOR THE

ROOSEVELT NATIONAL FOREST

By

C. N. Feast
Junior Aquatic Biologist

Survey - 1938



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ROCKY MOUNTAIN STATION

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ROCKY MTN. FOREST & RANGE
EXPERIMENT STATION

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INTRODUCTION

The Roosevelt Forest is located partly on the eastern slope of the Continental Divide, the eastern slope of the southern extension of the Medicine Bow Mountains, and the front range. It includes that portion of federal Forest land ranging from the James Peak area north to the Wyoming State line, excluding the Rocky Mountain National Park.

The principal fishing waters are the Boulder Creeks, St. Vrain Creeks, the Big Thompson River, the Cache la Poudre River, the upper waters of the Big Laramie River, and their tributary lakes and streams.

Game species of fish include the rainbow, the black spotted, the eastern brook, and the Lochleven trout. They have generally been introduced and the population is principally maintained by stocking.

GENERAL DISCUSSION

Old-time fishermen state that the grade of fishing today is far from equal to that of past years. This is to be expected on account of its accessibility and the heavy and continued fishing. These waters are proximate and easily reached by fishermen from a good many of the largest towns and cities in Colorado, and consequently the problem of maintaining a fair grade of fishing becomes one of management, recognizing these factors of demand and supply. Improved roads, increased popularity and advertising have caused an intense increase in tourist fishing use and demands.

Present management includes the planting of fish by state and federal hatcheries and agencies in cooperation with the sportsman. No direct control over all of this activity exists and there appears to be a lack of coordination. The Forest Service is using a preliminary survey report made in 1931 as the basis of their fish requisitions and plantings, insofar as it is possible to get the fish in the numbers and species requested. This survey was made by C. N. Feast, who was then employed by the United States Bureau of Fisheries. The streams and lakes are opened and closed to fishing, according to the State law, which specifies that lakes below 7500 feet in elevation and streams shall be opened to fishing on approximately May 28, and that lakes above 7500 feet in elevation shall be opened to fishing on June 10. Also, further control measures are adopted by closing a few of the upper tributaries until November 1, 1939. The season closes on all trout streams on October 31 and on lakes above 7500 feet on September 30.

Extensive yield studies were made on the Middle and South St. Vrain Rivers and some of the lakes in the headwaters, in order to arrive at an estimate which fairly accurately represents the yield of the streams and lakes of the Roosevelt Forest. These yield studies demonstrated very conclusively that the annual yield of most of the streams is very nearly equal to their capacity. This condition demands more than random stocking as a basis of correct management.

A great many conflicting interests were observed to be in existence. Water diversions and dams appear to be the topic over which there is most conflict. Inadequate screens at the inlets and the dumping of undesirable lake-bottom water into the streams are considered as detrimental to favorable trout environment. Also there are a good many irrigation diversions, private and corporate, that constitute an opportunity toward depletion of the fish population of the streams. The existence of Class A fishing preserves is objected to by some. There is also evidence of periodic pollution by mill and mine sediments.

Cooperation with sportsmen in this vicinity is favorable. Public sentiment is average. Most of the sportsmen agree that the grade of fishing is not generally so good as it should be, but that there are a few places still in existence where one might catch his limit. Most of them were emphatic in their demands for better management.

A survey disclosed that the problem of fish management for this Forest which must be put into effect is one where species, numbers and sizes of fish are planted, commensurate both with carrying capacities and demands. Conflicting interests should be reduced to a minimum and structural improvements should be installed that will assist in meeting the demand. All biological and natural conditions should be known and this information should be made the basis of the management plan. Local adoptions of control measures should not be for certain periods only, but should be put into effect according to actual conditions that exist, and should extend according to these same conditions and not to some arbitrarily established future date.

THE INVENTORY

Object.

The object of the inventory was to collect information as to quantities of fish and fish environment existing in the waters of the Roosevelt Forest. Before any program of management can be adopted, complete information as to all the factors that affect the life and production of fish must be surveyed and assembled.

Method.

The waters were surveyed as to types, volume, widths, areas, permanency, gradient, elevations, temperature and chemistry. Shelter was measured as to type, composition and density. Food conditions were measured--including plant, animal and mineral--collecting data as to kinds, quantity, distributions, availability and utilization. The watershed was observed as to character, cover and geology. Census and hydrographic and ecological distribution studies were made of the species present. Studies were made to determine yields. Factors of control were observed.

Recognition.

Superintendent Wright and Commander Paul Jones of the Peaceful Valley CCC Camp extended every cooperation to this project. I was assisted in making the survey by enrollees Virgil Huntley and Donald Adams of the Peaceful Valley CCC Camp.

THE STREAM SURVEY

Middle St. Vrain and South St. Vrain.

The first station adopted for study on the Middle St. Vrain was located about two miles above Peaceful Valley, at an elevation of about 9000 feet. At this point the watershed is moderately steep and covered generally with pine, fir, aspen and spruce. The headwaters of this stream are about eight miles above in more or less alpine territory. The St. Vrain glaciers lie at the head of two of the upper tributaries at about 12000 feet in elevation. The gradient of the stream at Station 1 is approximately 200 feet to the mile. The average width is 20 feet. The stream at this location is generally clear and at no time did I observe a murky state, either after a rainstorm or during spring run-off. The creek flows at this point in what is typed as a straight canyon section; it is quite swift and good in pool grade. The average summer temperature is low, ranging between 45 and 50 degrees F. No large fire burns or erosion areas were noted.

Station 2 on the Middle St. Vrain was located in the vicinity of Peaceful Valley. Little change was observed with the exception of an increase in width and water temperature. These changes were slight, however. On July 15, 1938, the flow was measured at approximately 90 cubic feet per second. The pool grade was classified as good.

Station 3 was located just above the bridge at Raymonds, Colorado. At this point the stream measured 36 feet in width, the volume measuring about 150 cubic feet per second. Pool grade was classified as average. In this report, a good pool grade will be listed as No. 1, an average as No. 2 and below average as No. 3. At this point some sheet erosion was observed as, following a quick rainstorm of approximately one-half inch in this drainage, the stream became muddy and carried 0.05 cc of silt per 15 ml. This figures

about 0.3 lb. per cubic foot. The muddy flow continued about four hours, from which it is computed that approximately 800 tons of soil were washed away.

Station No. 4 of the Middle St. Vrain was located about five miles below Raymonds. Here the width is about 35 feet. The pool grade was classified as No. 1. The stream flows in what is classified as a steep canyon. The elevation at this station is 6997 feet.

Just below this station, the Middle St. Vrain flows into the South St. Vrain and the stream is then named South St. Vrain to its confluence with the North St. Vrain, which is below the National Forest boundary.

Station No. 1 on the South St. Vrain was located just above the confluence with the Middle St. Vrain. The width at this location was measured at 20 feet and the flow was computed at 90 cubic feet per second on July 19. The elevation is approximately 7000 feet. The stream is relatively the same type as the Middle St. Vrain.

Station No. 2 on the South St. Vrain was located at the Lyons Camp Ground, which is about three miles above the Forest boundary. The elevation is approximately 6000 feet. At this location the pool grade was classified as No. 2. The width was measured at 37 feet, with a flow of 250 cubic feet per second on July 20, 1938. Here, the stream flows through what is classified as straight canyon type. At this point the stream temperature had increased to about 56 degrees F.

Stations 3 to 6, inclusive, were taken in the vicinity of Long and Brainard Lakes.

The dominant geologic formation is granite or its metamorphosed products.

With the exception of small amounts of fontinalis in the upper waters, very little plant life grows in this stream.

Yield Studies.

A study of the fish takeout from these two streams was made during the latter part of July and the first part of August. Two men were assigned to the task of patrolling the stream each weekday and Sunday. They contacted as many fishermen as possible and listed the information pertinent to this type of study.

The results of the St. Vrain study are as follows:

1. The average takeout per man-hour was 1.00 fish.
2. The average weight of the fish taken was 3.42 ounces.
(Annulus 3 1/4 years.)
3. The average length was 8 inches.
4. Computed takeout for season:

a. Total number for week days	5400
b. Total for Saturdays, Sundays and holidays	°°15800
Total season takeout	<u>21200</u>

°°Figures carried to the nearest 100.

Represents entire Middle and South St. Vrain.

5. The following number by species were taken:

Eastern brook	5000
Black spotted	6300
Rainbow	9200
Lochleven	700
	<u>21200</u>

6. The capacity of these streams computed by actual measurements and survey is 23100 seven to eight-inch fish.

7. Of the number of fishermen contacted, one-third were fishing with bait and two-thirds were using flies.

It is noted that the takeout for the season approximately equals the aquatic food carrying capacity of the stream. In this case, the load of demand on the food must necessarily be relieved by available terrestrial organisms, and therefore it is concluded that the yield would be normally classified as capacity. When this condition exists, it becomes necessary to adopt management measures other than hit or miss stocking programs to insure better fishing in waters where the degree of fishing is so intensive.

The following recommendations are given as a program of management for these streams:

1. Stock the lower waters with Lochleven, the sizes to be not less than 3 to 4 inches. The planting of small fry in the lower waters is not productive of results due to the high mortality. If small Lochleven fry are planted in the headwaters the probabilities are that they will be caught before natural downstream migration brings them to the lower sections. To insure adequate population in the lower waters, it is essential that fish of sufficient size to take care of themselves be stocked.

2. Stock the intermediate sections with rainbow, the sizes to be not less than 3 to 4 inches.

3. Stock the headwaters with black spotted. At this location, $1\frac{1}{2}$ -inch stock is sufficient.

4. Stock the lakes tributary to the South St. Vrain with eastern brook and rainbow.

5. Carry out yield studies in conjunction with annual stocking, in order to ascertain success of methods of management and to recommend further continuance or amendments of plan formulated.

6. With the proper stocking and operation of traps it may be possible to take trout eggs from Long Lake.

7. There are a good many suckers in the lakes tributary to the South St. Vrain, principally Long and Brainard. It is recommended that some effort be made to reduce their population; perhaps information could be disseminated, telling of the value of the sucker as a food fish. It disturbs the fish population balance to permit one species of fish to thrive and reproduce unmolested, while heavy inroads are continually being made on the population of the more desirable species.

8. See other parts of the report for more detailed planting plans and recommendations for retaining ponds.

No diseases or predators in damaging numbers were observed, and there was very little evidence of pollution.

Middle Boulder Creek.

Station No. 1 was located about midway between Nederland and Eldora. At this point the stream measured 30 feet in width with a flow of 324 cubic feet per second, on June 30. The temperature was measured at 52 degrees F. The pool grade was classified at 3 $\frac{1}{2}$. The color of the water was clear with practically no turbidity, and there was no evidence of erosion, even though the upper country had at one time been badly devastated by fire. The drainage slopes are moderately steep, of which the geology is principally granite. The covering is of pine, spruce, aspen and fir somewhat in patches due to past fires. The altitude at this station is about 8500 feet.

The stream at this point is uniformly steep and swift with very few pools, being mostly riffle water. The bottom is principally rock and rubble with average shelter; shade was classified as dense. There is no great fluctuation of the volume, except the normal spring high and the fall low. The general source of the stream is high country snow and rain water with lakes lying at the head of most tributaries. These lakes are of glacial origin. There are several diversion dams for mine and water supply purposes between Nederland and Eldora and probably most of them constitute a barrier to trout migration.

This stream is dammed for power purposes by the concrete Barker Dam below Nederland. This dam is about 175 feet in height and is an absolute barrier to fish migration as no fish ladder is provided. Except at times when water is running over the spillway, there is insufficient water flowing in the Middle Boulder between the dam and the confluence with the North Boulder, to provide suitable fish environment. Accordingly, this section of the stream should not be considered in a management plan.

One of the principal tributaries of the upper waters of the Middle Boulder is Fourth of July Creek, which drains Lake Dorothy and Diamond Lake into the Middle Boulder just above the town of Hessie. The elevation range of this stream is from 9000 to 11000 feet. Fourth of July

Creek is a very swift stream and low in pool grade. The grade of fishing is very poor and recommendation for management will be found in this report in "CONTROL OF FISHING."

Jasper Creek is another tributary to the Middle Boulder, with Jasper Lake lying at the headwaters at an elevation of 10733 feet. Woodland Creek is tributary to Jasper Creek with the Woodland Lakes, No's. 1 and 2, lying at the headwaters at an elevation ^{of} 10842 feet and 11090 feet respectively. These streams are very similar and recommendations for their management will be found in "CONTROL OF FISHING."

The South Fork is an important tributary to the Middle Boulder. It drains that country between Guinn Mountain, Rawlins Pass, the Divide and Woodland Mountain. King, Betty and Cliff Lakes lie at the headwaters. Recommendations for management will be found in "CONTROL OF FISHING."

The old town of Corona is located on top of Rawlins Pass, on the old site of the Denver and Salt Lake Railroad, which was using this roadway before the Moffat Tunnel was built. The railroad company has pulled the rails and automobile drivers are using this old right-of-way as access to the high country, driving in over the old ties. It is my recommendation that the use of this old right-of-way as a road be discouraged in order to maintain the upper country as a wilderness area.

A study of the Barker Reservoir was made at this time to ascertain to what extent it contributed in the life or reproduction cycle of fishes in the Middle Boulder. This study included bottom samples, plankton samples and gill-net hauls. The extent of fluctuation of water level is great, the Public Service Company draining the water to a very low level in case of water shortages. Under normal conditions the winter power load demand draws the lake to a very low level. The water volume is replenished by spring run-off.

At the time of study, the lake had filled quite rapidly, and as a result, the bottom food and plankton food measured practically nil; this was to be expected, as aquatic life had not had time to develop in the raw water or bottom.

Gill-net hauls produced an average of 12 suckers to one trout as the species ratio of inhabiting fishes. The two species of sucker found were the common sucker, Catostomus commersonii, and the Platte River sucker, Catostomus griseus. This ratio is entirely out of balance and is probably due to heavy trout fishing and practically no fishing for the sucker. Accordingly the sucker population increases by leaps and bounds, while the trout is constantly being depleted. Effort should be made to adopt some method to reduce the sucker population of this body of water, as undoubtedly it has its effect on the fish management of this drainage. Properly cooked and boned, the sucker is one of the finest of food fishes, and it should be popularized as such in order that a measure of control may be maintained in those waters where its numbers are excessive. Also it may be possible to install traps to capture them during their spawn run,

which is in the spring of the year. If trapping operations are successful they may be cooked and ground to provide one of the ingredients of a hatchery trout diet.

Fishing, as a whole, is very poor in all of the streams of the Middle Fork drainage, and in an endeavor to better this condition the State has closed Jasper Creek, Woodland Creek and the South Fork to fishing until November 1, 1939. Trout species present are native, rainbow and eastern brook.

South Boulder Creek.

Station No. 1 was located about one mile above Tolland. At this location the stream flows through a rolling meadow land several sections in area which is surrounded by moderately steep-sloped mountains. The East Portal of the Moffat Tunnel is situated at the upper end of this valley. At this station the stream was classified as No. 1 in pool grade and poor in shelter grade. The bottom is rubble and gravel with some rock. Riffles are average. The shade was classified as dense. The width at this location is 36 feet.

Station No. 2 was located about one-tenth of a mile below the second under-pass above Rollinsville. At this location the stream is 53 feet wide and on July 25 was flowing a volume of 180 cubic feet per second. The pool grade was classified as 1, color of the water as clear with no turbidity. Most of this drainage has at one time been badly devastated by fire. Even recently a fire burned over a large amount of land in the Jumbo Mountain area. The topography is moderately steep slopes with the principal vegetative covering being patchy or reproductive areas of pine, spruce, aspen or fir. The upper drainages, however, are fairly well covered with timber. The geologic formation is principally granite and gneiss. The elevation of Station 1 is 8600 feet and at this location the stream flows through a straight canyon type.

At East Portal, water from the Fraser River on the Western Slope is diverted into the South Boulder. This water raised the pH from 6.9 to 7.1, but lowered the temperature of the South Boulder from 51 degrees F. to 44 degrees F. as the water coming from the tunnel was 42 degrees F. in temperature. Lowering of the temperature is a detrimental factor, but the stabilizing effect may, in the long run, offset this detriment. The chemical conditions of the Western Slope water were practically the same as the South Boulder. As a matter of fact the parts per million content of bound carbonates were two and one-half parts higher. A great many lakes lie at the head of the tributaries of the South Boulder. These lakes vary from 10000 to 11000 feet in elevation and are of glacial origin.

The grade of fishing in the South Boulder would be classified as fair. Species present are native, rainbow and eastern brook trout.

North Boulder Creek.

Station No. 1 was located one-fourth mile below the intersection with the Ward-Nederland Highway. The stream measured 21 feet with a flow of 117 cubic feet per second on July 26. Pool grade was classified as No. 3, shelter average and shade dense. The character of the watershed is moderately steep hills covered with pine, spruce, aspen and fir. No extensive fires have burned over this area. Above this point the stream flows through land that prohibits public fishing. The land immediately above is privately owned and the headwaters are enclosed by a water right permit owned by the City of Boulder, Colorado. The only headwater tributary fishing that is permitted is in Rainbow Lakes.

This stream is badly in need of improvement and this work could be undertaken on that stretch of stream below the Ward-Nederland Highway for a distance of at least five miles, the type of structure being limited to the wire basket deflector. The stream is generally of sufficient depth but is very low in pool grade. This improvement is recommended. At this location there is a very desirable site for the construction of retaining ponds; for further details see "RETAINING PONDS."

On the average, fishing in this part of the stream would be classified as poor, species present being eastern brook, rainbow and a few native trout.

Station No. 2 was located two miles below Station No. 1. At this location the stream is very similar to Station 1, with the exception that the pool grade is somewhat better.

Caribou and Rainbow Creeks are tributaries to the Upper North Boulder. They are at the present time closed to fishing until November 1, 1939. See "CONTROL OF FISHING" for further management discussion.

The Cache la Poudre River.

The Cache la Poudre River is the largest stream in the Roosevelt National Forest, approximately 100 miles of main stream being within the boundaries. It is one of the principal fishing streams of the Forest and receives an intense degree of fishing. Some of the water is diverted from the lower section and used for irrigation. In this connection, water is diverted from the Big Laramie River through a tunnel to the Cache la Poudre.

In general, the stream is quite swift with numerous deep pools. One section flows through a series of meadows and is quite meandering; however, a portion of this section is enclosed in a Class A permit.

Station No. 1 was located just above the confluence of the Big Laramie diversion supply. At this point the stream is fairly swift with many deep pools. The midday temperature was measured at 50 degrees F. The average width at this location is 65 feet. The Big Laramie water changed the chemical condition of the water from pH 7.1 and bound carbonates 7.5 ppm. to 7.2 and 10.0 ppm. respectively.

Station No. 2 was located in the vicinity of the Gladstone Cabins. There was a slight increase in the temperature of the water. At this location the stream flows through meadow land, and other than that, there is very little difference than at Station 1.

Station No. 3 was located at Glen Echo. Water temperature measured 52 degrees F., width 70 feet. The stream at this location is of the riffle and pool type that is associated with meadow lands.

Samples at Station No. 4 were taken at the Narrows Picnic Ground. The temperature of the water was measured at 60 degrees F. At this location the canyon narrows and steepens and the stream width lessens to 50 feet. It was also noted that the bound carbonates reduced from 10.0 ppm. to 7.5 ppm.

Station No. 5 was located at the highway tunnel. With the exception of an increase in width, there is very little difference in the stream between Section 4 and Section 5.

Station No. 6 was located above the bridge at Columbine. Water temperature was 60 degrees F. At this section the stream flows through canyon type and is relatively swift and straight. The stream measured 80 feet in width.

The Cache la Poudre River flows through varying types of geological formations and vegetative cover. The lower sections of the drainage are principally of sedimentary origin, while the upper sections are principally granite and gneiss. The general covering is pine, fir, aspen and spruce. No extensive fires have recently invaded this area.

Yield studies made of this stream show an entirely different picture than that of the St. Vrain. In the first place the intensity of fishing per mile and per 10 feet of width was not nearly so high. Also, due to the various conditions, the yield per man hour was not so high as the St. Vrain. The Cache la Poudre is probably stocked way below its capacity; it is a large stream and more experience and ability are required to catch greater numbers; and due to its width, a lower proportion of its pools are available to the fisherman.

The following summary for the study on the Cache la Poudre is given:

1. The average takeout per man hour was 0.15 fish.
2. Lengths ranged from $6\frac{1}{2}$ to 17 inches with the majority of those taken averaging $6\frac{1}{2}$ to $7\frac{1}{2}$ inches.
3. Computed takeout for the season:

a. Total for weekdays	3000
b. Total for Saturdays and Sundays	8000
Total	11000 **

**Does not include private land.

4. The rainbow were by far the greatest number taken by species, with the Lochleven and native following in order. No eastern brook were taken during the days the yield studies were made.

5. The number of fly and bait fishermen appeared to be about equally divided.

From this study it was noted that the yield was way below the capacity of the stream and efforts should be made to stock these waters to capacity. The following recommendations are offered:

1. Stock the lower 15 miles (just above the Forest boundary) with Lochleven trout not less than 3 to 4 inches in length.

2. Stock the intermediate waters (15 miles above the boundary to Rustic) with rainbow trout, sizes to be not less than 3 inches in length.

The planting of fry in these large waters does not produce the proper results, and the equivalent amount of money should be spent in raising a smaller number to a larger size for large stream stocking purposes.

3. Stock the upper waters with $1\frac{1}{2}$ to 2-inch black spotted trout.

4. The stream contains a good many suckers.

5. Recurrent yield studies of this stream should be made to ascertain stocking results, yields and trends.

No diseases or predators in damaging numbers were observed.

More complete data regarding findings and recommendations for this stream are tabulated in other parts of the report.

Other Streams.

While making this survey, streams for study were selected as either important waters or as representative of certain types of waters. The information obtained from the study of these streams will be used as a basis of recommendations for other streams.

Other Data.

Complete tabulations of other findings of the survey are listed in another part of the report.

THE LAKE SURVEY

There are quite a number of lakes in the Roosevelt National Forest. Most of them are of glacial origin and lie at the headwaters of the streams at an average elevation of 10000 feet. They vary from

8 to 100 feet in depth. Most of the upper lakes are above timberline and are generally the deepest of the drainage due to more intense glacial scouring.

In making the survey of the lakes, a whole drainage or main tributary thereto was studied in order to get altitude and location comparisons. All food measurements taken were quantitative, which included bottom counts, plankton volume and terrestrial factor.

The grade of fishing in most of the lakes is generally good. As a rule they are inaccessible to the automobile and they must be reached by hike or pack horse, and as a result, the degree of fishing is not of sufficient intensity to cause damaging reduction of population. There are a few exceptions to this condition, however. One example is Brainard Lake. The degree of fishing in this lake is very heavy and consequently fishing is generally of a low grade. Lakes of this sort require intensive management.

Brainard Lake.

Brainard Lake lies on the upper waters of the South St. Vrain at an elevation of 10300 feet, and is 15 acres in area. It is an old natural lake that has had its area increased by the construction of a dam at the outlet. This dam increases the total depth about 6 feet. Recent improvements were made on this structure by the Forest Service.

When these improvements were made, a fish ladder was constructed at the spillway outlet which is a sort of tunnel construction located in the center of the dam. It is apparent that the fish ladder is not operating; the reason probably is that water coming through the spillway is too swift for migrating trout to successfully negotiate the jump from the fish ladder to the spillway. Spawning natives were observed attempting to jump the crest of the supplementary spillway. They were not able to make this jump on account of the flat apron at the foot of the spillway; insufficient run was available for them to negotiate the leap. It is recommended that stilling basins be installed on this apron so that the trout can successfully complete their spawn runs at this location.

Depth soundings were made and 12 feet was found to be the deepest point. Due to the uniformity of the lake bottom, only one station was taken for measurements.

The grade of fishing in this lake would be classified as poor due to the heavy degree of fishing. Also there is quite a high population of suckers in the lake.

No trout were taken in the gill-net hauls. Two suckers were taken; one was 6 inches long and weighed 4 ounces; the other was 14 inches long and weighed 1 pound and 9 ounces. Both were in very good condition with large layers of fat located in abdominal cavity. Two species were found: Catostomus griseus and Catostomus commersonii. The commersonii is one of the most abundant of the suckers and is a food fish of considerable importance. In the spring of the year, as spawning season approaches, these fish run up the streams in great numbers, and accordingly have been named the "June Sucker" in many localities.

The color of the water is a rather dark-brownish, turbidity - 12.

Yield studies of the fishing in Brainard Lake gave the following results:

1. The average takeout per man hour	0.35 fish
2. Average length	7.7 inches
3. Average weight	4.4 ounces
4. Average condition factor	1.4
5. Computed takeout for season:	
a. Total eastern brook	1600
b. Total natives	150 (black spotted)
c. Total rainbow	250
Total for season	<u>2000°</u>

°Computed to nearest fifty.

6. Most of the fishermen used bait as lure, using angleworms or salmon eggs. In this connection, it is very evident that some of the fishermen are using "baiting tactics" in order to make fishing better. This method is to scatter salmon eggs about before fishing to attract the fish and accustom them to eating salmon eggs, which are later used as lure. This is evident, as many of the fish stomachs examined contained several salmon eggs that were not punctured by a hook. Some fishermen used a mixture of hominy, corn and shrimp as a preliminary fish "bait." This practice should be discouraged.

7. A relatively large population of the sucker was observed. Live minnow bait should be legally prohibited in the high lakes. (Above 7500 feet in elevation.) See "CONTROL OF FISHING" for further discussion.

8. Food measurements show that the yield was approximately 90 percent of the computed capacity.

Long Lake.

This lake is located on the same stream as Brainard Lake, about one mile upstream. It is 10499 feet in elevation and about 40 acres in area. It is a natural lake and an attempt was made in the past to construct a dam across the outlet, but the structure was not completed. This partial construction is in no way a barrier to migration.

Depth soundings gave 10 feet as the greatest depth and the bottom contour is very uniform, that is, the bottom grades from zero depth to 10 feet very gradually without many pronounced shelf areas.

The grade of fishing in this lake is classified as fair. There are a few suckers in the lake and their increase should be prevented, if possible. A gill-net haul produced a total of 3 pounds, 3 ounces of fish of which 6 were eastern brook trout ranging from $6\frac{1}{2}$ to $9\frac{1}{2}$ inches in length, 1 black spotted trout $6\frac{1}{2}$ inches in length, 1 rainbow $7\frac{1}{2}$ inches, and 1 sucker $10\frac{1}{2}$ inches long. This sucker was commersonii species.

Yield studies of the fishing in Long Lake gave the following results:

1. The average takeout per man hour 0.16 fish
2. The average length
 - Eastern brook 8.6 inches
 - Rainbow 11.0 inches
 - Natives 6.5 inches(All measurements taken to end of caudal plate.)
3. The average weights
 - Eastern brook 6.3 ounces
 - Rainbow 12.0 ounces
 - Natives 2.0 ounces
4. Condition factor
 - Eastern brook 1.4
 - Rainbow 1.3
 - Natives 1.1
5. Computed takeout per season:
 - Total eastern brook 650
 - Total natives 150 (black spotted)
 - Total rainbow 300
 - Total for season 1100

6. Most of the fishermen used bait as lure, although there were a good many taken later in the season with the Davis spinner, baited either with angleworms or salmon eggs. Much "baiting" is done in this lake as well as Brainard Lake.

7. The yield was approximately 15 percent of the computed capacity.

Isabel Lake.

This lake is located on the South St. Vrain about two miles above Long Lake at an elevation of 10852 feet. This location is at the edge of timberline. It is a natural lake that has been tunneled so that it may be drained for irrigation purposes. It is typical of the upper lakes in this locality--rocky and precipitous shore lines, comparatively deep, silt bottom, and practically devoid of all types of higher plant growth.

The grade of fishing in this lake is very poor. None were taken during this survey, but it is reported that several years ago a few fish could be taken. Food studies produced no plankton food and only a small amount of bottom food in the order of Mullusca, genus Pisidium. A number of caddis fly larvae were observed along the shore line.

Alternate draining and filling is probably responsible for the low food grade existing in this lake. This body of water is situated very high in the drainage and the supply water is very pure and consequently low in nutrient materials. Continual draining tends to wash out any start in food development that is made. No stocking should be done.

Jasper Lake.

Jasper Lake lies at the headwaters of Jasper Creek, which is a tributary to the Middle Fork of Boulder, at an elevation of 10733 feet. The area is approximately 110 acres. It is a natural lake that has had the water level raised by the construction of a 12-foot dam, and consequently the upper 12 feet are subject to considerable variation in water level.

No fish ladder is provided, but due to no spawning waters above Jasper Lake, none is needed.

The grade of fishing in this lake is fair, fish takes ranging as high as 7 per man hour. The species present is principally eastern brook averaging from 6 to $8\frac{1}{2}$ inches in length, measured to the end of the caudal plate. This lake is reported as being one in which the fish never grow larger than $8\frac{1}{2}$ or .9 inches in length, regardless of stocking. In this case, gill-net hauls did not capture any fish larger than this size.

When the lake was full to the top of the dam, the deepest point was measured at 30 feet. That portion of the bottom covered by the water impounded by the dam is principally of a sandy, gravelly dirt formation. The deepest bottom is of a silt formation.

During the time that the survey was being made on Jasper Lake, a careful study was made of the number of fishermen, the number and species caught, the sizes, and the total hours of fishing done. The following results were obtained:

- | | |
|---------------------------------|----------------------------|
| 1. Fish takeout per man hour | 1.5 |
| 2. Average size | 7 to $9\frac{1}{2}$ inches |
| 3. Species taken | All eastern brook |
| 4. Estimated takeout per season | 1500 fish |

There are limited spawning opportunities in this lake and probably the population must be maintained by stocking. In analyzing plankton hauls, it was noted that most of the zooplankton were Cladocera, and there was a conspicuous absence of the Copepods. Most of the Copepoda collected in the various lakes of the Roosevelt were high in oil content and red pigmentation. The lack of these organisms in Jasper Lake may be a contributing factor to slow fish growth. This conclusion is only hypothetical, however, and much more study and experiment on this subject is necessary to arrive at positive determinations.

The part that the Copepoda and the Malecostraca play in the production of rich oils and vitamins in fish food should be determined, and if it is found that these organisms are essential or that they contribute to accelerated fish growth, steps should be taken to determine the reasons why such conditions are the case and to recommend accordingly.

Lower Woodland Lake.

This lake lies at the headwaters of Woodland Creek, also a tributary to Middle Boulder Creek. The elevation is given as 10842 feet. It is approximately 20 acres in area. It is a natural lake and is well supplied with a continuous flow of water.

The deepest point was measured at 5 feet and the bottom gradient is very uniform, sloping from the shore to the deepest point very gradually and uniformly. The bottom is practically all of a silt formation.

It is recommended that a drain and spillway be installed in this lake and that it be used as a retaining pond for the raising of fish to stock in the upper waters of the Middle Boulder Creek. In this connection, plankton hauling produced no organisms, and artificial fertilization and Copepoda transplanting should be done by using a plankton net in Upper Woodland Lake. Soybean meal sunk in burlap bags makes a good fertilizer. Certain amounts of peat have the same results. Bottom dredging produced midge larvae of the small variety which will be suitable as small trout food. The temperature of the water was measured at 52 degrees F. at 1:00 p. m. on August 21, 1938. The air temperature was measured at 60 degrees F.

Upper Woodland Lake.

Upper Woodland Lake is located about 3/4 mile above Lower Woodland at an elevation of 11090 feet. At this point, cover has been reduced to scrubby spruce. This is a natural lake and no irrigation works have been installed.

The grade of fishing in this lake is fair to good at certain times of the summer. It is one of the higher altitude lakes, and temperature conditions are not generally favorable to continued fish biting. The species of fish are the black spotted and the eastern brook. The temperature was measured at 46 degrees F. on July 21.

Food conditions in this lake are better than at Lower Woodland inasmuch as plankton hauling produced a good count of the Copepod Cyclops. The volume was measured at 0.15 cc per cubic foot.

It was estimated that the annual need for stocking is 20 percent.

The average size of the species of fish present is one-half pound.

King Lake.

King Lake is located at the headwaters of the South Fork of Middle Boulder Creek at an elevation of 11250 feet. The cover at this location has been reduced to principally scrubby spruce. The area of the lake is about 20 acres. This is a natural lake and there are no irrigation structures installed.

Bottom soundings were made and the deepest point was measured at 40 feet. Around the majority of the shore line the bottom deepens gradually for about 10 feet, then drops off very abruptly to the profundal bottom. The bottom structure of the littoral zone is rock and the profundal bottom is composed of sandy silt.

The grade of fishing while the survey was being made was very poor. This was perhaps due to the very low temperature resulting from ice cakes floating on the surface. The temperature (surface and bottom) was measured at 44 degrees F. on July 22. Gill netting captured the following fish in one haul:

1	Eastern brook - 11 inches, 10 ounces.	Condition factor - 1.07
1	Eastern brook - 6 inches	
1	Black spotted - $9\frac{1}{2}$ inches, 6 ounces	" " - 1.04
1	Black spotted - 10 inches, 7 ounces	" " - 1.04

Plankton hauls disclosed that most of the plankton at this time of the season was of the plant variety; however, a few small Copepods were taken per cubic foot of water. A number of the organisms were red in coloration.

It is estimated from observation and study of the growing season, that the annual need for stocking is 20 percent of the capacity.

Bob Lake, elevation 11450, and Cliff Lake, elevation 11600, both are located at the head of a tributary in the same drainage.

Rainbow Lakes.

These waters are a string of four main lakes located at the headwaters of Rainbow Creek, a tributary to the North Boulder Creek. They are relatively small lakes and the U.S.G.S. maps give their elevation as follows: #1 - 9900 feet; #2 - 10090 feet; #3 - 10100 feet; and #4 - 10190 feet. They average about 2 acres in area. They are natural lakes and are not used for purposes of irrigation.

The grade of fishing in them would be classified as poor, the reason probably being a very heavy intensity of fishing. It is estimated that the annual yield is approximately equal to the capacity. Food conditions in the lakes are good, especially bottom counts in Lake #3.

Very few fish are taken over $7\frac{1}{2}$ inches in length and the great majority of them are eastern brook.

Redfeather Lakes.

These lakes are a group of waters located in the Lone Pine drainage which is a tributary of the North Cache la Poudre. They are more or less dead lakes. It appears that they are formed by a high water table. Dams have been built on most of them into which water is diverted from the Lone Pine for irrigation purposes. At the present time, however, the irrigation company is not operating and no water is running in or out of the lakes except a small amount of seepage.

At one time a State Class A preserve license was held on all of these lakes, but this year the license was not renewed on Dowdy Lake or West (Twin) Lake and they are now opened to public fishing.

Twin Lake (Also called West Lake).

This lake is located just north of that point where the main road to Redfeather Lakes crosses the South Lone Pine. It is about 8200 feet in elevation. This body of water is not the same type as the headwater glacial lakes. It is located in a country of pine that is moderately steep in slope.

A dam has been built at the outlet to impound water for irrigation purposes, but at the present time no water is being diverted into the lake and except for rain or snow run-off, there is no regular supply of water. The depth was measured at 15 feet. On July 11, when the air temperature was 72 degrees F., the temperature of both the surface and the bottom was 62 degrees F.

On the day tests were made, the following oxygen conditions were found: surface concentration - 6.7 ppm; bottom concentration - 0.8 ppm. Plots from these measurements show that on this day only the upper $7\frac{1}{2}$ feet of the lake contained sufficient oxygen to support fish life. Also when conditions of this kind occur, it often happens that the upper zones of the lake are at the upper limits of the fish temperature tolerance. Accordingly, during a part of the summer the trout living in these lakes suffer conditions that are just within the range of their endurance.

It was reported by native fishermen that last summer many fish died during a spell of hot, quiet weather, which confirms the above statements regarding low oxygen and high temperature conditions.

There is a dense growth of littoral plants about the entire shore line of the lake. Collections of these plants were made for future identification. The oxygen given off by these plants is probably responsible for a great percent of the oxygen supply during both the summer and winter seasons. There is a great amount of food in the lake -- bottom, shore and plankton -- and probably the limiting factor of population is the concentration of oxygen that is either supplied by wind or higher plant growth.

Large schools of Cyprinidae were observed in the shallow water about the shore line. This minnow was identified as the Common Chub, Semotilus atromaculatus.

The algae content of the lake was very high, causing the water to be a heavy light green in color. The secchi disk could be observed less than two feet under the surface.

The grade of fishing was classified as from poor to fair. It is very spasmodic, many hours of fishing being necessary to catch very few fish. Some large rainbow may be caught and consequently the degree

of fishing is very heavy. A gill-net haul captured the following fish from Twin Lake:

1	Rainbow	1 pound, 4 ounces
4	Rainbow	6 inches
9	Chubs	Averaging $6\frac{1}{2}$ inches in length.

Dowdy Lake.

The outlet from Twin Lake drains into Dowdy Lake. The intervening distance measures about $1\frac{1}{4}$ mile with 10 or 15 feet difference in elevation. Dowdy Lake is an old natural body of water that has been dammed for irrigation purposes. At the time of survey, the water level was approximately the same as the original level.

This lake is very similar in all respects to Twin Lake, with the exception that it is larger in area. The depth was sounded to 22 feet. Oxygen conditions on the day of the survey were as follows: concentration at bottom - 2.5 ppm; concentration at surface - 10.2 ppm.

The grade of fishing in Dowdy is about the same as in Twin. The same species of fish populate both lakes, but it is estimated that the intensity of population is greater in Twin than in Dowdy. A gill-net haul captured 1 $5\frac{1}{2}$ -inch rainbow and 1 6-inch chub.

Conditions in Dowdy Lake are such that probably the limit of population is determined by the oxygen concentration conditions.

Bellaire Lake.

Bellaire Lake is located in Sec. 6, T. 9 N., R. 73 W. at an elevation of 8700 feet. It is also a dead water lake that is used for irrigation purposes by diverting water from Elkhorn Creek. At the time of the survey, the irrigation company was not operating and no water was being diverted into the lake. It appears that the level of the lake is maintained by the ground water table. The depth was measured at 15 feet.

August 18, the temperature of the water measured 59 degrees F., air temperature 75 degrees F. The oxygen concentration of the surface measured 6.0 ppm. and the bottom 0.0 ppm. On August 19, a hard wind of 17 miles per hour velocity blew steadily in this vicinity for about 12 hours. Retests of oxygen concentration demonstrated that after 4 hours of wind, the bottom oxygen supply had increased to 2.6 ppm. and to 5.0 ppm. after 12 hours of wind. This demonstrates conclusively the value of wind in the rehabilitation processes of lakes.

Fishing in this lake is poor. None were taken during the survey by any of the fishermen observed.

Generally, Bellaire Lake is classed in the same type as Twin Lake and Dowdy Lake. The Creedmore Lakes are also of the same type.

Rawah Lakes.

The Rawah Lakes are located at the headwaters of Rawah Creek, which is an upper tributary to the Big Laramie River. There are seven main lakes in this group, ranging from 10700 to 11450 feet in elevation. They are all of glacial origin, lying in granite basins. In structure, the higher lakes are deeper and the lower lakes are shallower, and in location, the upper lakes all lie above timberline.

Rawah #1.

This lake is the lowest of the four lakes on the main tributary. Depth soundings gave 8 feet as the deepest point with $\frac{3}{4}$ of the area being shoal type varying from zero to 4 feet in depth. Lake #1 is 10700 feet in elevation. The water temperature measured 59 degrees F. on the day of the survey.

Fishing is classified as good in this lake. Three hours' fishing produced a total of 27 fish on the dry fly. The fish taken were eastern brook, rainbow and black-spotted trout, averaging from 7 to 9 inches in length. On this basis, the takeout per man hour was 9 fish. The eastern brook were in good condition and it is recommended that this species of trout be put on the stocking policy for this lake. The rainbow and black spotted were not in so good condition, being rather thin for their length.

It may be that the time of spawning contributes to the poor summer condition of most of the rainbow and black-spotted trout. Cold temperatures probably delay the laying of eggs until late in June or early in July, the balance of the summer being required to recover from the ordeal. If such is the case, these species may not reach a state of good condition until late summer. The opposite is true of the eastern brook, however. They spawn in the fall and have the winter in which to recover, and consequently they reach a state of good condition much earlier in the summer.

One rainbow 18 inches in length was taken from this lake which was also not in the best of condition. It was one-half pound underweight considering an average condition factor of 1.0.

A good many small fish from natural reproduction were observed around the shore and in the small inlets of the lake. Some very small black-spotted or rainbow were also observed. No other species of fish besides trout were either taken or observed.

Rawah Lake #2.

This lake is situated about one-quarter mile above Lake #1 at an elevation of 10750 feet. It is also a shallow lake (8 feet) and is very similar in most respects to Rawah #1. Fishing in this lake is good and indications were that natural reproduction is partially caring for the replenishment of stock.

Rawah Lake #3.

Rawah Lake #3 differs from both #1 and #2. It lies at the foot of a glacial cliff and is very deep, depth soundings measuring 105 feet in the deepest point. The bottom recedes very slowly for about 25 to 50 feet, at which point it drops abruptly to the profundal bottom. The temperatures measured 55 degrees F. at the surface and 39 degrees F. at the bottom on August 26. The secchi disk could be seen at a distance of 18 feet under the surface.

This lake is a typical high glacial lake and lies at an elevation of 10965 feet. It is above timberline, with the exception of a few scattered scrubby spruce.

The survey of this lake was made in stormy weather and the grade of fishing was not good, but a gill net captured the following fish: 1 rainbow - $16\frac{1}{2}$ inches in length; 1 eastern brook - $11\frac{1}{2}$ inches in length; and 1 eastern brook - $5\frac{1}{2}$ inches in length. The meat of the rainbow and eastern brook was a deep red, also the layers of fat situated around the intestines were dark pink.

This bright meat and fat coloration is in all probability due to the rich colored oils contained in the micro-crustacea (Copepoda) that were eaten by these fish. The population of the Copepod, Diaptomus, was very high in this lake. Here again there was evidence that the Copepoda containing red oils is a contributing factor to favorable trout growth. The quantity of bottom food of this lake was greatly below that of Lakes #1 and #2, yet the fish growth and sizes were equal or comparable. It is concluded that the abundance of the Diaptomus in this case made up for bottom shortages. The diet of the large rainbow that was taken consisted very largely of this organism.

The following need for stocking was placed on these three lakes:

- #1 - 40 percent stock every other year.
- #2 - 40 percent stock every other year.
- #3 - 10 percent stock every third year.

Other lakes in this vicinity will be compared to these lakes on a location and altitude basis. Further findings and discussions will be found in other parts of the report.

RETAINING POND SITES

Desirable retaining pond sites are not very abundant on the Roosevelt Forest. There are very few favorable springs, and where sites are possible from a construction standpoint, the supply water must be diverted from a nearby stream.

It is recommended that the following sites be utilized for the construction of retaining ponds:

North Boulder Creek.

This site is located about 1000 feet below the intersection of the Ward-Nederland highway and North Boulder Creek. Old mining operations in this vicinity included construction of a pond of about $1\frac{1}{2}$ acres at this location. This pond is almost entirely intact, with the exception of a washed out gate structure.

Action should be taken to secure this land and put the pond in shape for fish-rearing operations. It is also possible to construct a similar pond just below. About 2 acres can be impounded and complete construction will be necessary. Also, there is a possible site for a pond of the same type on the opposite side of the creek a short distance below the road. Approximately one acre could be impounded here. Total pond area available - $4\frac{1}{2}$ acres.

Water to supply these ponds must be diverted from North Boulder. This stream, however, drains a large upper lake region and is relatively constant in its flow. At this location there is practically no evidence of flood flows. It is estimated that diversion structures could be made effectively and economically.

The following structural installations are recommended for each pond:

1. Gate to be type W-1.
2. Collecting well, type W-2.
3. Combination screen and check box, type W-3.

Details of these structures can be found in the Wildlife Section of the Construction and Maintenance Handbook.

It is recommended that a flow of not less than 400 gallons per minute be passed through each pond.

The Division of Engineering should be advised of the possibilities of this site in order that they may survey and submit plans and specifications for the unit.

The operation of the ponds should be allotted as follows:

1. 23,000 rainbow to be raised in the 2-acre pond.
2. 15,000 Lochleven to be raised in the $1\frac{1}{2}$ -acre pond.
3. 20,000 rainbow to be raised in the lower pond.

Operation should be year-round and each stock of fish should be retained for a period of one year before planting. See stocking plan for distribution of these fish.

Jasper Creek.

At a point upstream from the take-off of the trail from the valley proper, there is a possible retaining pond site on the first tributary coming from the right on the way upstream. This site is

located about one-half mile above the point where the trail starts the long climb toward Jasper Lake.

At this location it is possible to divert this small stream into two depressions, and by the construction of two relatively small dams about 7 feet in height, about $1\frac{1}{2}$ acres of water can be impounded. Fish reared in these ponds can be used to stock the waters of Jasper Creek and the lakes in the upper waters of the Jasper drainage.

Structure installations should include earth dams, and types W-1, W-2 and W-3 auxiliaries.

The site is accessible to the truck within a mile and one-half, and with a small amount of work it would be possible to construct a wagon trail to the site, in order to haul in construction materials. Hauling fish to and from the pond can be arranged through cooperation with local dude ranches operating saddle and pack horses.

The annual rearing policy should recommend 10,000 eastern brook.

South Boulder Creek.

Just above the town of Tolland, on the right side of the road, there are three ponds that have been built by beaver some time ago. They are located on a side spring and are not subjected to high or flood waters.

It is recommended that an experiment be conducted on these ponds to ascertain if they can be drained by using a 4-inch portable centrifugal pump. If it is possible to do so, plank collecting wells should be installed at the deepest point in order that all the water may be drained into them. These wells should be built of 2-inch lumber, 4 feet by 8 feet by $1\frac{1}{2}$ feet in dimensions.

No gates should be installed. If it is possible to drain them with a pump, pumping should be adopted as a regular draining process. If at any time in the future, the beaver should fail to maintain their structures, no large investment is wasted. This method is recommended for use on other beaver dams of small flow.

If it is possible to operate these ponds on this basis, about 10,000 rainbow should be reared annually for stocking in the waters of South Boulder Creek in this vicinity.

Middle St. Vrain.

It is recommended that a bottom-buried hog-wire fence be built around this pond to keep the beaver out. The rock-pile drain should not be installed. The cost of successfully operating this type of drain exceeds the installation of a proper fence. A rearing pond must be operated as such or desired results will not be obtained. Engineering should survey the site and design a more suitable diversion from the creek to the pond.

It is my understanding that this pond has been neglected from a stocking standpoint. It is recommended that it be placed on a regular operative basis. It is not economical to install these structures and allow them to stand unoperated, even if some additional work is needed to make them more effective.

It is my recommendation that this pond be stocked with natives for use in stocking the high lakes in this drainage suitable for planting of this species. Other species desired can be obtained from other locations.

Lower Woodland Lake.

This lake is a body of water of about 20 acres that readily lends itself to conversion to a retaining pond of the first order. It is a shallow lake about 6 feet deep, which, on account of the moraine structure at the outlet, permits easy installation of outlet structures.

This lake lies on the upper waters of Woodland Creek, a tributary to Middle Boulder Creek, at a relatively high elevation. There is practically no fluctuation in flow and spillway, and gate construction could be installed simply and effectively.

Lumber, cement, etc., must be packed in on horses for a distance of four miles, but considering the possible ease of construction, transportation would not be excessive. The gate installation should be an ordinary Hardesty drain with a concrete spillway. A collecting well should be installed at the deepest point of the pond floor.

This pond could be used for rearing of fish needed to stock the entire upper waters of Woodland Creek and the South Fork of Middle Boulder.

SPAWN-TAKING STATIONS

The following lakes were studied for their spawn-taking possibilities and during the spawning seasons temporary traps should be installed to determine the feasibility of these lakes as spawn-taking stations. At least their future potentialities should be established.

1. Long Lake on the South St. Vrain drainage - This lake should be well stocked with eastern brook trout and experimented with as a spawn-taking possibility. It is estimated that 2,000,000 eggs could be taken annually with very little expense.

2. Rawah Lakes - These lakes are located on the Rawah Creek which is a tributary to the Big Laramie. Experimental trapping should be done to ascertain the extent of the possibility of taking rainbow and native eggs. At the present time, it is not considered economical, but a future date may establish the need of eggs in this locality. It is estimated that about 2,000,000 eggs could be taken annually.

Transportation requirements are as follows:

- a. Long Lake - Truck and one mile pack operation.
- b. Rawah Lakes - Truck and seven miles pack operation.

FISH TRANSPORTATION

The Roosevelt Forest is planning the construction of a standard Forest Service transportation tank to be used in the distribution of fish.

Regarding fish transportation, it is recommended that holding ponds be constructed at the following locations:

1. Ranger Station at Rollinsville.
2. Town of Nederland.

A holding pond is a concrete structure 4 feet wide, 12 feet long, 20 inches deep at one end and 15 inches deep at the other, with the exception of a $1\frac{1}{2}$ foot by 3 foot well at the lower end, which should be placed 1 foot below the deepest floor level. This well is installed in order to drain the water into a small space.

The supply and drain is of simple construction, being of $1\frac{1}{2}$ and 2-inch pipe with gate valves. A screen similar to the pump outlet of the fish transportation tank is satisfactory for the outlet. The supply should be not less than 20 gallons per minute. A plan of this structure is being submitted to the Division of Engineering for drawings and specifications.

The purpose of the holding pond is a central distributing point for the transportation of fish received from hatchery supply trucks. Generally, a hatchery truck arrives loaded with many cans of fish to go to several consignees and the drivers are in no position to plant each consignment or even to wait indefinitely for a consignee in case he should not arrive promptly at the truck destination.

The fish could be placed in the holding pond and distributed to the various points with efficiency and regularity. Wild rushing to get the fish off the truck and to the stream and lakes could be eliminated in case of unforeseen delays, changes or mix-up in distribution plans.

The interior of the holding pond should be painted with two coats of asphalt concrete paint in order to reduce holding losses to a minimum. The water supply should be clean and as cold as it is possible to get it. The holding pond should be intended for emergency use only and extra fish handling should be kept to a minimum.

FISH SCREENS

There are undoubtedly many fish losses which occur as a result of the several diversion projects on the Roosevelt Forest streams. At the present, little can be recommended in the way of effective screening.

The problem should be kept always in mind and should effective screens be developed, attempts should be made to properly screen all power and irrigation diversions on these waters.

FISH WAYS

No noticeable obstructions on important migration stretches were observed, except the supplementary spillway on Brainard Lake. Stilling basins should be installed.

THE CONTROL OF FISHING

Several of the tributaries of the Boulder Creeks have been closed to fishing. The dates of closure include all fishing days during the seasons of 1938 and 1939. In other words, they are closed until November 1, 1939.

These waters are:

1. South Fork of the Middle Fork of Boulder Creek.
2. Jasper Creek, a tributary to Middle Boulder Creek.
3. Woodland Creek, a tributary to Jasper Creek.
4. Rainbow Creek, a tributary to North Boulder.
5. Caribou Creek, a tributary to Rainbow Creek.

All tributaries to these creeks are likewise closed.
All lakes thereon are open to fishing.

The following comments are made and recommendations given regarding the closure of these waters:

1. Food grade and temperatures are generally low, which in all probability is the chief reason for the slow growth of the trout. Annulus studies show that a trout of minimum size to pass the legal limit is about three or three plus years of age. Combining these factors with a very heavy degree of fishing, it is readily seen that most of the fish do not succeed in growing past the legal length age. In this case, a regular program of closure should be adopted, rather than one of intermittent or neglected action according to the irregular demands and desires of local sportsmen.

2. The South Fork of the Middle Boulder should be closed for three years and opened for two. This program should be extended only on the basis of satisfactory results found by survey.

3. The Woodland Creek should be closed permanently as a continual nurse stream for smaller fish.

4. The upper waters of Jasper Creek should be closed for the same reason.

5. The lower waters of Jasper Creek (section through meadows) should be closed for three and opened for two years.

6. Rainbow Creek should be permanently closed to function as a nurse stream.

7. Caribou Creek should be closed for three and opened for two years.

Periodic fish growth and population increase studies should be made each summer to note the results being obtained, so that recommendations for discontinuance or extension can be made well enough in advance that proper action can be taken when needed.

Closing the streams to fishing instead of the stocking of large trout is recommended in these waters principally for economic reasons. Available large fish should be reserved for lower waters where fishing is more in demand and where the problems of management are more difficult. Also upper waters are natural nurse waters and should be considered as such in a closure program.

Other programs are recommended as follows by drainages:

Streams.

South Fork of Boulder.

Follow established seasons and stock with as large fish as is possible to obtain or rear.

Middle Fork of Boulder.

In addition to the above-mentioned creeks in this drainage, Fourth of July Creek should be closed on a program of three seasons closed and two seasons opened.

Larger fish ($2\frac{1}{2}$ " x 3") should be planted in the streams near Nederland and Boulder.

Every effort should be made to rid the Middle Boulder drainage above the Barker Reservoir of the sucker fish. Food value publicity should be given.

North Fork of Boulder.

Stock waters below Ward-Nederland road with larger fish ($2\frac{1}{2}$ " to 3") and adopt the program as outlined for Rainbow and Caribou Creeks.

St. Vrain Creeks.

Stock waters with larger trout and follow established fishing seasons.

Big Thompson River.

Stock with larger trout and follow established seasons. In this case the course of plans and operation of the Western Slope-Big Thompson Diversion should be carefully followed. If possible, it should be requested that surface lake water be diverted instead of bottom water.

Cache La Poudre River.

Stock with larger trout and follow established seasons.

Lakes.

It is my understanding that all lakes above 7500 feet in elevation have been closed until June 15 in order to protect the trout that live in them from the fisherman during the spawning season. In this case, I have the following comments to offer:

Due to the high elevation of most of the natural lakes in the Roosevelt and the resulting late spring breakup with late temperature rises, spring spawning in most of them is generally delayed later than June 15. If spawning is the reason that these lakes are closed, a distinct and separate season should theoretically be placed on each lake according to the actual dates of the spawning therein. Also, considering the fact that the fish spawn in the tributary streams if possible, these tributaries should also be closed during the same dates.

It is my recommendation that if spawning habits are the reasons of regulating the opening and closing of high lakes, the program be amended as follows:

1. Lakes of the Roosevelt Forest above 10,000 feet in elevation be closed until July 1 and open until September 30.

2. Tributary streams to these lakes also be closed during the same dates.

3. Lakes from 7500 to 10,000 feet in elevation to be closed to June 15, with tributary streams also closed. These lakes should be open until October 15.

Gill net and other population studies demonstrated that the sucker is becoming an ever-increasing resident of the high lake. This is undoubtedly due to the fisherman using small live suckers as minnow bait and throwing the remaining live ones overboard at the end of the day's fishing. Minnow fishing should be prohibited in lakes above 7500 feet in elevation or in those lakes that are connected by a passable stream to lakes of higher elevation. The following examples of net hauls are given to show the trend in several of the lakes:

1. Barker Reservoir - Elevation 8200 feet.

Ratio of sucker to trout 12 to 1.

2. Brainard Lake - Elevation 10,300 feet.

Ratio of sucker to trout 3 to 1.

3. Long Lake - Elevation 10,500 feet.

Ratio of sucker to trout 1 to 9.

THE CONTROL OF DISEASES

Very little evidence of trout disease was found in any of the waters of the Roosevelt Forest. A few of the fish taken from the St. Vrain and South Boulder contained Nematoda stomach parasites. They were not in damaging numbers, however, and no control methods are recommended.

No diseases were observed in any of the lakes.

THE CONTROL OF PREDATORS

Predators in numbers sufficient to be considered a detriment were not observed and specific control methods are not recommended.

THE CONTROL OF POLLUTION

There is no general pollution occurring in any of the streams or lakes. A small amount of pollution occurs in the Middle Boulder below Nederland when the Wollfongue Mill is in operation. Only a short stretch of stream is affected, however, and the control of this pollution is a local problem.

Some mine pollution occasionally occurs in the lower waters of the North Boulder. Should any serious pollution occur at any time, it is recommended that control be arranged through concerted local action.

STREAM IMPROVEMENT

The following stream improvement projects are recommended:

North Boulder.

That portion of the North Boulder below the Ward-Nederland highway can be materially improved by the installation of deflectors to decrease the high percentage of riffles and to increase the pool grade. The type of structure should be substantial, rock-wire-basket deflectors constructed in pairs, that is, one on each side pointing downstream in the shape of a 60-degree V. They should be built so that their height will be about level with the high water level, with about 4 or 5-foot opening between the points of the V.

The flow of the North Boulder is very uniform and the deflectors should not be intended to scour but should be built to create a combination of pool and eddy by speeding up a portion of the flow past a section of quiet water.

Some stream improvement has been done on the Middle St. Vrain in the vicinity of Peaceful Valley. For the most part this work was sufficiently substantial and has proved effective; however, several of the structures have underwashed and it is recommended that they be repaired.

The upstream junction of the cross-logs and the bottom of the stream should be covered with hog-wire, nailing the fencing to the log and laying it upstream. This should be then covered with heavy to fine pine brush and finally covered with a generous layer of gravel. Structures needing excessive repair should be removed.

GENERAL SUMMARY AND COMMENTS

1. The food grade of streams as a whole is not above "fair" to "average."

2. The food grade of most of the lakes is classified as "good" to "excellent."

3. Trout stomach content studies show that about 30 percent of the food eaten by trout in streams and about 23 percent in lakes is of terrestrial origin. (Percentage expressed by volume.)

4. The presence of the Copepoda in lakes appears to be a governing factor of accelerated growth. It also seems that if these organisms are absent the growth is retarded. The copepods in the common general Cyclops and Diaptomus are apparently rich in an oil of red coloration that is important from a food standpoint. More concrete knowledge should be obtained regarding these hypotheses.

5. Concerning the different aquatic foods eaten by the trout of both streams and lakes, the following summaries are listed:

a. Ninety-eight percent of the aquatic food eaten by trout in streams by count is included in the following four orders: (The average number per fish eaten by 93 fish is shown in comparison with bottom counts for 23 stations.)

<u>Ephemera</u> <u>(May fly)</u>		<u>Diptera</u> <u>(Midge, etc.)</u>		<u>Plecoptera</u> <u>(Stone fly)</u>		<u>Trichoptera</u> <u>(Caddis fly)</u>	
Food	Bottom	Food	Bottom	Food	Bottom	Food	Bottom
23	100	73	58	111	39	55	63

From the above it may be seen that the stone fly and the diptera were slightly preferred. Close diagnosis shows that no outstanding preference according to availability was shown as perhaps under natural conditions, the stone fly is not so available as the average caddis fly.

b. Ninety-six percent of the aquatic food of trout in lakes was of the order Diptera, being principally the midge fly. This bears a direct ratio to available food, as in most lakes examined the midge was by far the most abundant available food. The species most often found was the "blood worm," the common red lake-bottom midge. They generally become available as food when they are rising to the surface during their emergence.

6. So far as the Roosevelt is concerned, there seems to be no definite connection between pH (hydrogen ion concentration) and food values and growths.

7. On the average, food values increased progressively downstream. In this respect, a lake tends to raise the food value in the stream below for some distance.

8. Food grade in most of the high glacial lakes is relatively good due to the great abundance of Diaptomus and Cyclops, and in general, the abundance of these organisms was greater in the upper lakes, especially those over fifteen feet in depth.

9. The value of the clam as a food is low due to its low availability factor.

10. In those waters where the scud or "fresh-water shrimp" was abundant, it was a favorite food of the trout. The Diaptomus and Cyclops were eaten in great numbers where they were abundant.

11. The annual take-out of most accessible waters is very close to being equal to the possible yield according to capacity. To compete with this problem, regular and systematic stocking of larger trout must be adopted, especially in the lower waters. Where the degree of fishing is continually heavy, not less than four-inch trout must be stocked. In this respect, every possible site suitable for the construction of retaining ponds must be utilized. Even sites located outside of the Forest boundary should be given consideration and some attempts should be made to secure the proper cooperation for construction and operation.

12. This management program should not be considered as a cure-all or last possible word. Resurveys should occasionally be made, and regular check-ups on the more variable factors should be included in an annual management plan. It is recommended that the following studies be an annual program for the Roosevelt Forest:

- a. Results of retaining pond operation.
- b. Results of plantings.
- c. Grade and degree of fishing.
- d. Consistency in the following of the management program.
- e. Results of the adoption of the plan.
- f. Yield studies.
- g. Results of control methods and adoptions.
- h. Law enforcement.

An annual report should be made of these studies. The method of making yield studies is explained under caption "Yield Studies."

13. Yield studies show that most stocking has been relatively successful. No outstanding failures of continued plantings of certain species were observed. Eastern brook should be restricted to lakes and beaver pond streams and Lochleven and rainbow should be planted generally in the lower water. Natives perhaps do better in the upper tributaries.

14. On account of irrigation diversions and steep gradients, no planting is recommended in Rawah and McIntyre Creeks. The extent of private land below requires private management of these waters.

15. Exact information should be obtained as to every fish planted in Roosevelt waters. This information should be accurately recorded.

16. Forest records show that the last important stocking of the Middle and South St. Vrain was in 1935, when 55,000 eastern brook and 61,000 rainbow were planted. Yield studies showed a takeout of 5,000 eastern brook and 9,200 rainbow, about three plus years old. This is a minimum of 9 percent survival for the eastern brook and a 15 percent survival for the rainbow. As the yield was near to being equal to the computed capacity for these streams, these figures may be deductively used as a basis of general survival. The economy of restocking with rainbow can also be seen.

17. Artificial betterment of food conditions is not recommended at the present time.

YIELD STUDIES

These studies were made in order to determine some index as to stocking results and annual yield. Extensive observations were made during periods of one week to one month. The study was made on a section of stream, and the following observations were made each day and recorded:

1. Date and weather conditions.
2. Number of fishermen seen.
3. Number of fisherman contacted.
4. The total number of fish caught by species.
5. The average lengths and weights of each.
6. The total weight.
7. Total hours observed.
8. Total miles observed.
9. Type of lure being used.

Observations were made on weekdays and Sundays.

Results obtained were recorded as follows:

1. The average takeout per man hour.
2. The average weight of the takeout.
3. The average length.
4. The total number of fishermen and fisherman hours.
5. The computed takeout per season by species, considering 60 average fishing weekdays and 16 Saturdays and 16 Sundays, which time includes the fourth of July and Labor Day.

The computed yield was then compared with computed capacities to determine stocking results and to formulate future management programs.

In order to efficiently carry out the program as recommended in this report, an intensive yield study should be made on some stream and lake where accurate measurements on total takeout can be made. Sites must be selected where every fisherman using the stream or lake can be contacted. The following sites are recommended and the points to be studied are given:

1. North St. Vrain. (At point where road to Estes Park leaves canyon.)

This section of stream is blocked by a gate and all fishermen must pass the station when entering or leaving on their way to or returning from their day of fishing. Studies should include:

- a. Full-time observation. (Beginning to end of fishing day.)
- b. Daily record of:
 - (1) Number of fishermen.
 - (2) Total fishing hours of each.
 - (3) Total number of fish taken by species, lengths, and weights. Sample fish scales should also be taken to obtain annulus factor.
 - (4) Total weight of fish taken.
 - (5) Weather and lure.
- c. This study should include the period including all days from opening day of season to September 30, and should be made every summer for five years. Two men should be detailed to this study, preferably trained CCC boys.

2. Long Lake.

This lake must be reached by trail and all fishermen can be contacted from one station.

- a. The same type of information as obtained for stream study should be recorded.
- b. The study should include the period from the opening date to September 15.
- c. The crew should include two trained CCC boys.

The following factors should be made the object of the study:

1. Number of fishermen.
2. Number of fisherman hours.
3. Number of fish caught by species, weights and sizes.
4. Results of stocking.
5. Most desirable species and sizes to plant.
6. Takeout per angling hour.
7. Frequency of planting that is needed.

8. Fishing load curve.
9. Takeout load curve.
10. Index for use in studies of other streams and lakes based on short and extensive observations.
11. The economic value of the trout taken.
12. A complete daily chart of temperature for the stream from two miles above the station to the Forest boundary. Temperatures should be taken at 8:00 a. m., 10:00 a. m., 1:00 p. m., 3:00 p. m. and 5:00 p. m. A maximum and minimum thermometer should be used to record daily and nightly maximums and minimums.

COST OF SURVEY

°Biologist - $2\frac{1}{2}$ man months	\$ 500.00
Two assistants (CCC) - 5 man months (1 CCC man = \$60.00/month)	300.00
Pickup mileage	100.00
Depreciation of equipment	30.00
	<u>\$ 930.00</u>
Miscellaneous (horse hire, etc.)	70.00
	<u>70.00</u>
TOTAL	\$1000.00

°This time includes supervisory time spent on San Juan and San Isabel (about one-half month).

SUMMARIES OF INVENTORY

Lists and tabulations of the findings of the inventory that was made of lakes and streams are assembled on the following pages.

PHYSICAL DATA - STREAMS

- 35 -

PHYSICAL DATA - LAKES

Name	: App. : : Ac-: Elev. : : res :	: Natural : : or : : Artificial :	: Dam : : Height : : Ft. :	: Character : : of : : Shore :	: Depth : : Max. : : Ft. :	: Color : : Factor :	: Turbidity : : Factor :
Brainard	: : : 15:10300:	: Upper 6 ft.: : Artificial:	: : : 12 :	: Open-sandy: : Peaty-Trees:	: : : 12 :	: Light : : Brown :	: : : 12 :
Long	: : : 40:10499:	: : : Natural :	: : : : :	: Partly op-: : en-Slight-: : ly rocky :	: : : 10 :	: : : Clear :	: See : bottom :
Isabel	: : : 25:10752:	: : : Natural :	: : : : :	: : : Rocky :	: : : : :	: : : Bluish :	: : : : :
Rainbow #3	: : : 10:	: : : Natural :	: : : : :	: Rocky-: : Wooded :	: : : 12 :	: : : Green :	: : : 12 :
Jasper	: : : 110:10733:	: Upper 15 ft.: : Artificial:	: : : 15 :	: Rocky-: : Partly : Wooded :	: : : 30 :	: : : Brownish:	: : : : :
Lower Woodland	: : : 20:10842:	: : : Natural :	: : : : :	: : : Wooded :	: : : 5 :	: : : Bluish :	: See : bottom :
Upper Woodland	: : : 22:11090:	: : : Natural :	: : : : :	: : : Rocky :	: : : 15 :	: : : Bluish :	: : : : :
King	: : : 100:11300:	: : : Natural :	: : : : :	: : : Rocky :	: : : 40 :	: : : Bluish :	: : : 15 :
West	: : : 25: 7900:	: Upperpart : : Artificial:	: : : 8 :	: Open : Grassy :	: : : 15 :	: : : Green :	: : : 3 :
Dowdy	: : : 150: 7880:	: Upperpart : : Artificial:	: : : 20 :	: Open : Grassy :	: : : 22 :	: : : Green :	: : : 3 :
Bellaire	: : : 10: 8800:	: Upperpart : : Artificial:	: : : 20 :	: Wooded : Rocky :	: : : 15 :	: : : Green :	: : : 3 :
Rawah #1	: : : :10700:	: : : Natural :	: : : 8 :	: Wooded : Rocky :	: : : 8 :	: Light : : Blue :	: See : bottom :
Rawah #2	: : : :10750:	: : : Natural :	: : : 8 :	: Wooded : Rocky :	: : : 9 :	: Light : : Blue :	: See : bottom :
Rawah #3	: : : :10965:	: : : Natural :	: : : 35 :	: : : Rocky :	: : : 105 :	: Light : : Blue :	: : : 8 :

COMPARISONS - STREAMS SURVEYED

Name of Stream	Section	Station No.	Average Daily Temp.	# Aquatic Insects per 10 ft.	Average Size Takeout In.	Average Annulus Takeout
Middle St. Vrain	: 1 mile above CCC	: 1	: 44° F:	38.0:)	:	:
	: At CCC	: 2	: 50° F:	59.0:)	:	:
	: Raymond's	: 3	: 50° F:	97.0:)	7.18:	3/
	: 5 miles below Raymond's	: 4	: 50° F:	75.0:)	:	:
South St. Vrain	: 5 miles below Raymond's	: 1	: 58° F:	45.0:)	:	:
	: Lyon's Campground	: 2	: 56° F:	52.0:)	:	:
	: Above Long's	: 3	: 45° F:	96.3:)	7.81:	3/
	: Above Brainard	: 4	: 54° F:	70.0:)	:	:
	: Below 300' Brainard	: 5	: 54° F:	84.5:)	:	:
	: 2 miles below Brainard	: 6	: 58° F:	116.0:)	:	:
South Boulder	: Near Tolland	: 1	: 44° F:	58.0:)	8.06:	3/
	: Near Rollinsville	: 2	: 52° F:	92.0:)	:	:
Middle Boulder	: Above Dam	: 1	: 52° F:	55.0:)	:	:
Fourth July Cr.	: Tributary	:	: 44° F:	53.0:)	7	3
Jasper Creek	: Tributary	:	:	:	:	:
North Boulder	: 1/4 mile below highway	: 1	: 51° F:	129.0:)	5.75:	3-
	: 2 miles below highway	: 2	: 58° F:	102.0:)	:	:
Rainbow Creek	:	:	:	:	:	:
	:	:	: 52° F:	78.0:	:	:
Poudre River	: Above Laramie Tunnel	: 1	: 50° F:	55.0:)	:	:
	: Gladstone's	: 2	: 50° F:	57.5:)	:	:
	: Rustic	: 3	: 52° F:	38.0:)	8.65:	3/
	: Narrows Picnic Ground	: 4	: 60° F:	57.5:)	:	:
	: At Cable	: 5	: 60° F:	129.0:)	:	:
	: Above Columbine	: 6	: 56° F:	115.0:)	:	:

COMPARISONS - LAKES SURVEYED

Name of Lake	: Total : : # Food : : Per Acre :	Depth :	Temperatures : : Surface:Bottom:	Elevation:
Brainard	: 93 :	: 12' :	: 53° F: 50° F:	: 10300 :
Long	: 210 :	: 10' :	: 52° F: 51° F:	: 10499 :
Isabel	: 530 :	: Not : : Sounded:	: 58° F: :	: 10852 :
Rainbow #3	: 800 :	: 12' :	: 57° F: 57° F:	: 10100 :
Jasper	: 598 :	: 25' :	: 47° F: 47° F:	: 10733 :
Lower Woodland	: 280 :	: 5' :	: 52° F: 52° F:	: 10852 :
Upper Woodland	: 765 :	: 15' :	: 46° F: 46° F:	: 11090 :
King	: 172 :	: 40' :	: 44° F: 39.8° F:	: 11250 :
West	: 475 :	: 15' :	: 62° F: 62° F:	: 8200 :
Dowdy	: 306 :	: 22' :	: 62° F: 59° F:	: 8200 :
Bellare	: 668 :	: 15' :	: 59° F: 59° F:	: 8700 :
Rawah #1	: 215 :	: 8' :	: 59° F: 59° F:	: 10700 :
Rawah #2	: 332 :	: 9' :	: 59° F: 59° F:	: 10750 :
Rawah #3	: 872 :	: 105' :	: 55° F: 39° F:	: 10965 :

STREAM CAPACITIES

Name	Sta- tion	Section	Temp.	# Food	Pool	Shel- ter	Capa- city	Length Sec-	Width Ft.	Capa- city	Total Plus Terr. Factor
				Per Mi.	Grade	Grade	permi. per 10'	tion			
				Per 10'							
M. St. Vrain	1	1 mi.	44°	38	1	1	65				
		above									
		CCC									
	2	CCC Camp	50°	59	3	1	47	10	38	2480	3000
	3	Raymond's	50°	97	1	1	340	4	36	4520	5500
So. St. Vrain	4	5 miles	50°	75	1	1	137	5	35	2400	3000
		bel. Ray.'s									
	1	5 miles	58°	45	3	1	71				
		bel. Ray.'s									
	2	Lyon's	58°	52	1	1	177	7	37	4584	5500
So. Boulder		Camp									
	3	Above	45°	96	3	1	81	1	10	81	100
		Long's									
	4	Above	54°	70	3	1	75	$\frac{1}{2}$	18	68	85
		Brainard									
M. Boulder	5	Below	54°	84	3	1	78				
		Brainard									
	6	2 mi. bel.	58°	116	1	1	295	15	22	4900	6000
		Brainard									
	1	Near	44°	58	2	1	67	5	24	800	1000
So. Boulder		Tolland									
	2	Near	52°	92	2	1	150	14	53	11130	13000
		Rollins - ville									
4th July Cr. Jasper	1	Above	52°	55	3	1	52	11	30	1672	2000
		Dam									
		Lower					137	6	35	2880	3500
No. Boulder			52°	55	3	1	52	6	12	379	470
			52°	55	2	1	76	4	10	304	380
	1	$\frac{1}{4}$ mi. bel.	51°	129	3	1	107	4	21	898	1100
Rainbow Cr.		Hiway									
	2		58°	102	3	1	145	5	21	1522	1900
	1		52°	78	1	1	181	4	5	368	450
Poudre River	1	Above	50°	55	3	1	58	19	65	7100	8700
		Tunnel									
	2	Glad-	50°	57	3	1	59	4	66	1550	1900
		stone's									
	3	Rustic	52°	38	3	1	45	10	70	3120	3800
	4	Narrows	60°	57	3	1	88	11	50	4340	6000
So. Poudre	5	Cable	60°	129	3	1	218	4	65	5668	7000
	6	Colum-	60°	115	3	1	215	65	80	11180	13000
		bine									
No. Poudre			60°	115	3	1	215	45	40	38700	48000
No. Poudre			50°	55	3	1	58	39	25	5760	7000

STREAM CAPACITIES

Name	Sta- tion	Section	Temp.	# Food	Pool	Shel- ter	Capa- city	Length Sec-	Width Ft.	Total Capa- city	Plus Terr. Factor
				Per Mi.	Grade	Grade	permi. per 10'	tion			
Buckhorn	:	:	58°	75	2	1	163	19	6	1858	2300
Big Thompson	1	Between	58°	130	1	1	282	8	50	11280	13000
	2	Bound.	58°	130	1	1	282	5	50	7050	8700
No. Fork Thompson	:	:	58°	130	1	1	282	17	12	5746	7000
No. St. Vrain	:	:	58°	100	1	1	295	24	30	21240	26000
No. Lone Pine	:	:	50°	55	3	1	58	19	5	551	680
So. Lone Pine	:	:	50°	55	3	1	58	12	5	348	430
Deadman Cr.	:	:	48°	94	2	1	109	6	6	392	480
Nunn Creek	:	:	48°	94	2	1	109	7	6	457	560
Roaring Fork	:	:	48°	94	2	1	109	5	6	327	400
Seven Mile Creek	:	:	48°	94	2	1	109	6	5	327	400
Elkhorn Creek	:	:	48°	94	2	1	109	12	5	654	800
Sheep Creek	:	:	48°	94	2	1	109	12	8	1040	1200
Miller Creek	:	:	48°	94	2	1	109	3	5	163	200
Cabin Creek	:	:	48°	94	2	1	109	8	10	872	1100
Jenny	:	:	52°	55	2	1	76	5	10	300	380

LAKE CAPACITIES

Name	Location	#	Growth Food: Sea- per son Acre: Mos.	Ave. Size: Fish: Acre:	Cap. per Acre:	Capa- city	Plus Terr.	Elev.
							Factor:	
Echo	2S-74W	170:	4	$\frac{1}{2}$ ##	100:	60:	6000:	7800:11072
James Peak	2S-74W	170:	4	$\frac{1}{2}$ ##	100:	60:	6000:	7800:11090
Heart Lake	17-2S-74W	170:	4	$\frac{1}{2}$ ##	100:	80:	8000:	10400:11270
Heart Lake #1	9-2S-74W	280:	4	$\frac{1}{4}$ ##	350:	20:	7000:	9000:10950
Heart Lake #2	8-2S-74W	170:	4	$\frac{1}{2}$ ##	100:	15:	1500:	2000:11350
Crater #1	4-2S-74W	425:	4	)	250:	40:	10000:	13000:10450
Crater #2	4-2S-74W	425:	4	)$\frac{1}{2}$ ##	250:	60:	15000:	20000:10550
Lower	4-2S-74W	425:	4	)$\frac{1}{2}$ ##	250:	30:	7500:	10000:10580
Upper	4-2S-74W	425:	4	)	250:	30:	7500:	10000:10997
Arapaho	4-2S-74W	170:	4	$\frac{1}{2}$ ##	100:	52:	5000:	6500:11165
Forest Lake #1	34-1S-74W	425:	4	)$\frac{1}{4}$ ##	500:	30:	15000:	19500:10915
Forest Lake #2	33-1S-74W	425:	4	)$\frac{1}{4}$ ##	500:	30:	15000:	19500:10915
Jenny Lake	27-1S-74W	425:	4	$\frac{1}{2}$ ##	500:	10:	5000:	6500:10950
Yankee Doodle	27-1S-74W	425:	4	$\frac{1}{2}$ ##	500:	11:	5500:	7000:10750
King	20-1S-74W	172:	4	$\frac{1}{2}$ ##	100:	20:	2000:	2600:11600
Betty	20-1S-74W	170:	4	$\frac{1}{2}$ ##	100:	50:	5000:	6500:11450
Cliff	17-1S-74W	170:	4	$\frac{1}{2}$ ##	100:	20:	2000:	2600:11600
Lost	24-1S-74W	485:	5	$\frac{1}{4}$ ##	700:	20:	14000:	18000: 9800
Woodland								
Lower	15-1S-74W	280:	4	$\frac{1}{4}$ ##	350:	20:	7000:	10000:10842
Upper	16-1S-74W	765:	4	$\frac{1}{2}$ ##	470:	22:	10500:	13000:11090
Jasper	10-1S-74W	598:	4	$\frac{1}{4}$ ##	700:	110:	77000:	100000:10733
Thumb	9-1S-74W	425:	4	$\frac{1}{2}$ ##	250:	5:	1200:	1500:10950
Diamond	3-1S-74W	425:	4	$\frac{1}{2}$ ##	250:	75:	18000:	23000:10960
Dorothy	33-1N-74W	170:	4	$\frac{1}{2}$ ##	100:	20:	2000:	2600:12050
Triple #1	24-1N-74W	425:	4	)	250:	10:	2500:	3200:10560
Triple #2	24-1N-74W	170:	4	)$\frac{1}{2}$ ##	100:	10:	1000:	1300:11150
Triple #3	25-1N-74W	170:	4	)	100:	5:	500:	650:11350
Goose	19-1N-73W	425:	4	$\frac{1}{4}$ ##	500:	25:	11000:	14000:10550
Island	20-1N-73W	425:	4	$\frac{1}{4}$ ##	500:	40:	20000:	26000:10190

LAKE CAPACITIES

(Continued)

Name	Location	#	Grow-	Ave.	Cap.	Capa-	Plus	
		Food	ing	Size	Per	Acres	city	Terr.
		Per	Sea-	Fish	Acres		Factor	Elev.
		Acres	son					
			Mos.					
Brainard	4-1N-73W	93	4	$\frac{1}{4}$	110	15	1600	2100:10300
Long	4-1N-73W	210	4	$\frac{1}{2}$	130	40	5200	6700:10499
Isabel	12-1N-73W	53	4	-0	130	25	3200	4000:10852
Mitchel	32-2N-73W	425	4	$\frac{1}{2}$	250	15	3700	4800:10650
Blue	36-2N-74W	170	4	$\frac{1}{2}$	100	40	4000	5200:11350
Red Deer	18-2N-73W	425	4	$\frac{1}{2}$	250	5	1100	1400:10300
Lily	14-4N-73W	485	5	$\frac{1}{2}$	360	10	3600	4700:9050
Hourglass	13-7N-73W	485	5	$\frac{1}{2}$	360	40	14400	18700:9400
Sheep Creek	18-8N-74W	485	5	$\frac{1}{2}$	360	53	19000	25000:9000
Zimmerman	25-7N-73W	425	4	$\frac{1}{2}$	250	10	2500	3300:10450
Peterson	22-7N-75W	485	5	$\frac{1}{2}$	360	35	12500	16000:9450
Trap	21-7N-75W	425	4	$\frac{1}{2}$	250	10	2500	3300:10000
Twin	20-7N-73W	485	5	$\frac{1}{2}$	360	4	1400	1800:9350
Browns	3-7N-74W	425	4	$\frac{1}{2}$	250	10	2500	3300:10450
Rainbow #3	32-1N-73W	425	4	$\frac{1}{4}$	250	10	2500	3300:10000
Comanche	15-7N-74W	425	4	$\frac{1}{2}$	250	2	500	650:10000
Mirror	33-7N-74W	170	4	$\frac{1}{2}$	100	10	1000	1300:11350
Clark #1			4	)	250	15	3700	4800:10850
Clark #2			4	)	100	10	1000	1300:11150
Clark #3			4	)	$\frac{1}{2}$	100	5	500:650:11075
Clark #4			4	)	100	10	1000	1300:11075
Clark #5			4	)	100	10	1000	1300:11075

LAKE CAPACITIES

(Continued)

Name	Location	#	Grow-	Ave.	Cap.	Capa-	Plus	
		Food:	ing	Size	Per	Acres:	city	Terr. Elev.
		Per	Sea-	Fish	Acres:		Factor:	
		Acres:	son					
			Mos.					
Rawah #1		215:	4	)	54:	8:	420:	520:10700
Rawah #2		332:	4	)	210:	8:	1600:	2000:10750
Rawah #3		872:	4	)	550:	35:	19000:	25000:10965
Rawah #4		170:	4	)	$\frac{1}{2}$ #: 100:	30:	3000:	4000:11450
Rawah #5		425:	4	)	250:	5:	1100:	1400:10950
Rawah #6		425:	4	)	250:	2:	500:	650:10750
Rawah #7		425:	4	)	250:	3:	750:	1000:10770
Camp #1	4-8N-76W	425:	4	)	$\frac{1}{2}$ #: 250:	20:	5000:	6500:10500
Camp #2	4-8N-76W	425:	4	)	$\frac{1}{2}$ #: 250:	30:	7500:	10000:10850
McIntyre #1	31-9N-76W	425:	4	)	250:	15:	3700:	4800:10675
McIntyre #2	31-9N-76W	425:	4	)	$\frac{1}{2}$ #: 250:	10:	2500:	3200:10750
McIntyre #3	30-9N-76W	425:	4	)	250:	8:	2000:	2600:10500
Creedemore #1	4-10N-73W	485:	6	)	930:	15:	13000:	17000: 8350
Creedemore #2	4-10N-73W	485:	6	)	$\frac{1}{2}$ #: 930:	12:	11000:	14000: 8350
Creedemore #3	4-10N-73W	485:	6	)	930:	12:	11000:	14000: 8250
Twin Lakes	20-8N-74W	485:	5	)	$\frac{1}{2}$ #: 700:	10:	7000:	9000: 9250
Dowdy	27-10N-73W	306:	6	)	$\frac{1}{2}$ #: 290:	150:	43500:	56000: 8200
West	33-10N-73W	475:	6	)	$\frac{1}{2}$ #: 450:	25:	11000:	14000: 8200
Bellaire	5-9N-73W	668:	6	)	625:	10:	6250:	7800: 8450
Blue	33-8N-76W		4	)		10:		:10850
Laramie	32-8N-75W	400:	5	)	$\frac{1}{2}$ #: 100:	10:	1000:	1300: 9350

CHEMICAL ANALYSIS

STREAMS

Date:	Name of Stream	Section	Station:	Air Temp.:	H ₂ O Temp.:	pH:	CO ₂ :	Bound:	Weather:
7/18:		:1 mi. above CCC camp	: 1	:60° F:	:44° F:	: 6.9:	:7 ppm:	:Clear	
7/15:		:At CCC camp	: 2	:68° F:	:50° F:	: 6.7:	:4.5 "	:Cloudy	
7/18:	M. St. Vrain	:At Raymond's	: 3	:74° F:	:50° F:	: 6.9:	:6.5 "	:Rain	
7/19:		:5 mi. below Raymond's	: 4	:68° F:	:44° F:	: 6.9:	:7 "	:Clear	
7/19:		:5 mi. below Raymond's	: 1	:85° F:	:58° F:	: 6.9:	:6.5 "	:Clear	
7/23:		:Lyon's Campground	: 2	:72° F:	:56° F:	: 6.9:	:6.5 "	:Clear	
8/3 :	So. St. Vrain	:Above Long's	: 3	:76° F:	:45° F:	: 6.0:	:4.5 "	:Clear	
8/4 :		:Above Brainard	: 4	:76° F:	:54° F:	: 6.5:	:4.0 "	:Clear	
8/4 :		:Below Brainard 300 '	: 5	:64° F:	:54° F:	: 6.5:	:5.0 "	:Clear	
8/1 :		:2 mi. below Brainard	: 6	:80° F:	:58° F:	: 6.7:	:4.5 "	:Cloudy	
7/26:	South Boulder	:Near Tolland	: 1	:73° F:	:44° F:	: 7.1:	:7.5 "	:Cloudy	
7/25:		:Near Rollinsville	: 2	:78° F:	:52° F:	: 7.1:	:7.5 "	:Cloudy	
6/30:	Middle Boulder	:Above dam	: 1	:	:52° F:	:	:	:Clear	
7/1 :	Fourth July Cr.	:Trib. M. Boulder	: 1	:65° F:	:44° F:	: 6.5:	:	:Clear	
6 :	Jasper Creek	:Trib. M. Boulder	: 1	:	:	:	:	:	
7/26:		: $\frac{1}{4}$ mi. below Ward-	: 1	:72° F:	:51° F:	: 7.1:	:8.5 "	:Clear	
:	N. Boulder	:Nederland Highway	:	:	:	:	:	:	
7/27:		:2 $\frac{1}{4}$ mi. below	: 2	:68° F:	:58° F:	: 6.9:	:	:P. C.	
7/13:	Rainbow Creek	:	: 1	:72° F:	:52° F:	: 6.7:	:12.0"	:P. C.	
:		:	:	:	:	:	:	:	
8/23:		:Above Poudre-Laramie	: 1	:78° F:	:50° F:	: 7.1:	:7.5 "	:Clear	
:		:Tunnel	:	:	:	:	:	:	
8/23:		:Gladstone's	: 2	:78° F:	:50° F:	: 7.2:	:10.0"	:Clear	
8/25:		:Rustic	: 3	:72° F:	:52° F:	: 7.3:	:7.5 "	:Clear	
8/24:	Poudre River	:Narrow's Picnic Ground	: 4	:80° F:	:60° F:	: 7.3:	:7.5 "	:Rain	
8/24:		:At Cable	: 5	:78° F:	:60° F:	: 7.3:	:7.5 "	:Clear	
8/24:		:Above Columbine	: 6	:74° F:	:56° F:	: 7.3:	:7.5 "	:Clear	
:		:Laramie Diversion	:	:	:	: 7.3:	:24.5"	:Clear	
:		:Tunnel	:	:	:	:	:	:	

CHEMICAL ANALYSIS

LAKES

Date	Name of Lake	Air : Temp.	Depth	H ₂ O : Temp.	O ₂ : % : ppm	pH	Free CO ₂	Bound CO ₂	Wind	Weather
					Sat					
7/12	Brainard	:72° F:	12'	:50° F:	13.0:115:	6.5:	1.5:	5.0:	Light	Clear
		:72° F:	1'	:50° F:	12.0:106:					
7/14	Long	:52° F:	10'		:10.8:	: 6.5:	1.5:	6.0:	Light	Cloudy
8/2	Isabel	:84° F:	Not Sound-	:58° F:		: 6.0:			Strong	Clear
		:ed								
7/29	Rainbow #3	:77° F:	12'	:57° F:		: 6.7:		6.0:	Strong	Clear
7/21	Lower Woodland	:60° F:	5'	:52° F:						
7/21	Upper Woodland	:52° F:	15'	:46° F:		: 6.4:		3.0:		
		:70° F:	40'	:39.8° F:						
7/22	King	:70° F:	1'	:44° F:		: 6.7:		4.5:		
		:72° F:	15'	:62° F:	.8: 8:				None	Clear
8/16	West		1'	:62° F:	6.7: 69:	7.6:		28.0:		
			22'		: 2.5:	:7.6/		30.0:		Clear
8/17	Dowdy		1'		:10.2:					
		:75° F:	15'	:59° F:					Heavy	Clear
8/18	Bellaire	:75° F:	1'		: 6.0: 59:	7.6:		15.0:		
		:75° F:	6'		: 4.5: 44:					
8/23	Rawah #1		8'	:59° F:		: 6.9:		8.0:		
	Rawah #2		9'							
	Rawah #3		105'	:39° F:		: 6.0:		5.0:		
			1'	:55° F:						

SATISFACTORY

BIOLOGICAL DATA - STREAMS

Stream	Date:Map: :No.:	Section	Aquatic Count (Bottom per Sq. Ft.) (Fish per Stomach)														Terrestrial Count per Stomach														Remarks	
			Sta- tion:	Bottom	:Cole- optera:	:Ephem- erida:	:Dip- tera:	:Ple- cop- optera:	:Trich- optera:	:Crustacea:	:Mol- lus- ca:	:Oligo- chaeta:	:Fish	:Per	:Sq. Ft.	:optera:	:nata:	:Worms:	:dop- tera:	:Wt.	:Vol.	:Per	:%	:Fish								
Middle St. Vrain	:7/18:	:Upper	:1	:Gr,Ro,Ru:	:4	:1	:1	:1	:	:	:	:	:	:.33:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:Adding terrestrial factors.
	:7/15:	:Upper	:2	:Gr,Ro,Ru:	:11	:2	:1	:1	:3	:	:	:	:2	:.5:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:7/18:	:Intermediate	:3	:Gr,Ro,Ru:	:4	:1	:2	:1	:1	:	:	:	:	:.825:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
7 Eastern Brook	:7/19:	:Lower	:4	:Gr,Ro,Ru:	:1	:1	:5	:2	:	:	:	:	:1	:.638:	:	:	:1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
7 Rainbow	:	:	:	:	:2	:5	:1	:20	:	:	:	:1	:1	:	:1	:1	:1	:	:	:	:1	:.08:	:26:	:	:	:	:	:	:	:	:	:
7 Lochleven	:	:	:	:	:4	:3	:	:2	:	:	:	:	:1	:	:2	:	:	:	:	:	:1	:.1:	:20:	:	:	:	:	:	:	:	:	:Average per fish.
	:	:	:	:	:1	:4	:8	:4	:1	:	:	:1	:1	:	:1	:1	:1	:1	:1	:	:1	:.08:	:22:	:	:	:	:	:	:	:	:	:
South St. Vrain	:8/3:	:Above Long Lake	:3	:Ro,Ru,Gr:	:13	:6	:1	:4	:	:	:	:	:	:.825:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/4:	:Above Brainerd	:4	:Ro,Ru,Gr:	:5	:2	:3	:	:	:1	:2	:	:	:.60:	:	:	:	:1	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/4:	:Below Brainerd	:5	:Ro,Ru,Gr:	:6	:4	:1	:5	:	:1	:	:	:	:.72:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/1:	:2 miles below Brainerd Lake	:6	:Ro,Ru,Gr:	:10	:5	:2	:2	:	:1	:	:	:	:1.00:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:7/19:	:Above Confluence	:1	:Ro,Ru,Gr:	:1	:	:1	:2	:2	:	:	:	:	:.385:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:Algae present bottom.
	:7/20:	:Lyon's Campground	:2	:Sa	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
1 Lochleven	:	:	:	:	:2	:	:1	:2	:1	:17	:	:	:	:.44:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
20 Rainbow	:	:	:	:	:	:	:1	:9	:	:3	:	:	:1	:	:	:1	:	:	:	:	:	:.1:	:80:	:	:	:	:	:	:	:	:	:Average per fish.
17 Eastern Brook	:	:	:	:	:	:	:4	:	:1	:4	:	:	:	:	:	:	:1	:3	:1	:	:	:2	:.33:	:27:	:	:	:	:	:	:	:	:Nematodes present in stomachs.
	:	:	:	:	:	:	:1	:9	:3	:5	:	:	:	:	:	:	:1	:3	:	:	:	:1	:.27:	:37:	:	:	:	:	:	:	:	:
South Boulder	:7/26:	:Near Rollinsville	:1	:Ru,Sa,Ro:	:1	:12	:3	:1	:1	:	:	:	:	:.50:	:	:1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
2 Eastern Brook	:7/25:	:Near Tolland	:2	:Ru - Ro	:1	:25	:	:	:	:	:	:1	:	:.79:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
1 Rainbow	:	:	:	:	:	:	:12	:6	:1	:	:	:	:1	:	:1	:5	:	:	:	:	:	:	:1.75:	:22:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:5	:8	:3	:	:	:1	:	:	:1	:2	:1	:	:	:	:	:	:.15:	:8.1:	:	:	:	:	:	:	:	:Nematodes present in stomachs.
Middle Boulder	:6/30:	:Above dam	:1	:Ro,Ru,Gr:	:1	:4	:1	:1	:	:	:	:1	:	:.47:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
4th July Creek	:7/1	:Tributary Middle Fork Boulder	:1	:	:1	:8	:1	:2	:1	:	:	:	:1	:.45:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
1 Eastern Brook	:	:	:	:	:	:	:6	:8.2:	:	:1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Jasper Creek	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
6 Eastern Brook	:	:	:	:	:	:1	:9	:	:1	:	:	:1	:	:	:	:1	:1	:	:	:	:	:	:.02:	:17:	:	:	:	:	:	:	:	:
North Boulder Creek	:7/26:	:1/4 mile below Ward-Nederland	:1	:Ru,Ro,Gr:	:1	:11	:1	:1	:4	:	:	:	:	:1.1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:Highway	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:7/27:	:	:2	:Ru,Ro,Gr:	:2	:2	:3	:1	:2	:	:	:1	:	:.88:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
2 Rainbow	:	:	:	:	:	:	:2	:	:4	:	:	:1	:	:	:	:54	:2	:	:	:	:	:	:.32:	:20:	:	:	:	:	:	:	:	:
1 Eastern Brook	:7/31:	:	:	:	:	:1	:8	:	:	:	:	:5	:	:	:	:10	:2	:	:	:	:	:	:1.75:	:17:	:	:	:	:	:	:	:	:
Rainbow Creek	:7/13:	:	:1	:	:1	:33	:1	:3	:2	:	:	:3	:	:1.4	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
7 Eastern Brook	:	:	:	:	:	:5	:5	:1	:6	:	:	:	:	:	:1	:4	:4	:	:	:	:	:	:.68:	:26:	:	:	:	:	:	:	:	:
Poudre River	:8/23:	:Above Poudre-Laramie Tunnel	:1	:	:4	:1	:1	:1	:	:	:	:	:	:.44:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/23:	:Gladstone's	:2	:	:3	:1	:1	:1	:	:	:	:	:	:.49:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/25:	:Rustic	:3	:	:2	:2	:1	:2	:	:	:	:	:	:.33:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/24:	:Narrow's Campground	:4	:	:4	:3	:4	:3	:	:	:	:	:	:.49:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/24:	:Above Tunnel	:5	:	:1	:2	:1	:1	:	:	:	:	:1.1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:8/24:	:Above Columbine	:6	:	:1	:3	:4	:2	:3	:	:	:1	:	:.99:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
14 Rainbow	:8/22:	:	:	:	:	:1	:1	:1	:2	:	:1	:	:1	:	:1	:10	:1	:	:	:	:	:	:.23:	:18.9:	:	:	:	:	:	:	:	:
	:8/29:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

BIOLOGICAL DATA - LAKES

Name of Lake	Aquatic Count (Bottom - per 1/4 Sq. Ft. Fish - per stomach)														Terrestrial Count per Stomach														Remarks	
	Date:	Sta:	Depth:	Bottom:	Cole:	Ephem:	Dip:	Ple:	Tri:	Crustacea:	Mol:	Digo:	Other:	cc per:	Total:	Plankton:	Lbs.:	Lbs.:	Total:	Hyme:	Cole:	Earth:	Lepi:	Dip:	Other:	Orth:	Grams:	Terr.:		
	tion:		Ft.		optera:	erida:	tera:	oop:	chop:	lus:	choeta:			Sq. Ft.:	per	cc	cc	per	per	per	per	per	per	per	per	per	per	per		Vol.:
					tera:	tera:				Hya:	Gam:	ca:			Sq. Ft.:	Phyto:	Zoo:	Acre:	Acre:	Acre:	tera:	tera:	tera:	tera:	tera:	tera:	tera:	Fish:	%:	
Brainerd	7/12:	1	12	Si				5				5			.22:	.96:	Trace:													
3 Rainbow								19	1																			.41	50	
11 Eastern Brook								9	1	2											1	1	1				1	.52	60	
Isabel	8/2:	1	Not Sounded:	Ro, Si				5				66			1.25:	5.5			530										Contained salmon eggs	
																													Only 10% considered available	
Long	7/14:	1	10	Si				14							.25:															
	8/6:	1	10	Si				26				50			.50:															
	7/15:	2	8	Si				20				16			.50:															
11 Eastern Brook	7/15:	3	8	Si				30				32			.75:															
3 Rainbow								1	942			3									4	2		1				.13	3.7: Contained salmon eggs	
1 Black Spotted								141													1			1				.016	.8: Contained salmon eggs	
								1													8							.1	.99	
Rainbow 3	7/29:	1	12	Si				127							1.87:	8.23:														Pink meat, salmon egg
2 Eastern Brook	7/29:							1													2								one contained white matter	
Rainbow 4	7/29:																													
3 Eastern Brook								1	2	1											1	7						.05	.33	
Jasper	7/19:	1&2	30	Si, Gr, Sa				55				82			.67:	2.97:	.2	318	280	.598										Upper 15 feet contained Zoo
12 Eastern Brook								122				1		1							2	3					1	.18	15.4	
Lower Woodland	7/21:	1	5	Si				49				150	4		1.25:	5.5				280										
Upper Woodland	7/21:	1	15	Ro, Si, Gr				63				22	3		1.25:	5.5	.15	240	525	.765										
King	1	40						6					1	1	.25:	1.1	.09	.01	32	140	.172									Algae present--20 feet effective depth
1 Black Spotted								27				1									2	4						.2	.20	
2 Eastern Brook								1	377	1				1								3						.25	.11	
West	8/16:	1&2	15	Si				12				3			.25:	1.1	.35	.35	335	140	.475									Algae numerous--Zoo plankton--Cladocera
		3		Shore				33				84	2		23	2.5	11													Covers 5800 square feet--some algae--
																														round leeches
7 Rainbow								1	1	81		12	1		1						1									One stomach contained
																														principally plant
																														growth
Dowdy	8/15:	1	22	Si				18				2	1	1	.5	2.2	.4	.04	93	213	.306									
				Shore				30				70	2		20	2.25	10													For 34800 square feet
1 Rainbow								24				65	1																	Contained plant growth
Bellaire	8/18:	1	15					5				33	8	1	1.25:	5.5	.81	.09	143	525	.668									
Rawah #1	8/23:	1	8					25				88			.5	2.2	.0125	.0031	2.6	213	.215.6									
5 Eastern Brook								195				1		1								4	3					.148	.29	
Rawah #2	8/24:	1	9					40				55			.25:	1.1	.2	.192	140	.332										
5 Eastern Brook								1						3							19	14		1				.58	.60	One contained principally pine needle
1 Native								12				4									14							.15	.75	
1 Rainbow								1						6							80	8		4				.25	.100	
Rawah #3	1	85						16				6	2				.13	830	42.5	.872.5										
1 Rainbow															.1	.44					12	10		22				.65	.78	
1 Eastern Brook												2			.5	2.2					1	2						.25	.50	

STOCKING PLANS AND REQUISITIONS

On the following pages complete plans for requisitioning, stocking and planting are submitted. The stocking plan was based on the actual survey made on representative waters.

These plans should be adopted as nearly as it is possible to do so.

The requisitions are made up in key form as to dates for use in making annual requests for fish.

STREAMS

Name	Section	7" Capacity	Need %	Recommended Planting Plan					Frequency of Plant	Point of Plant Distribute	Suggested Hatchery	Deliver	Man Crew		
				B. Spotted Native	Rainbow	Eastern Brook	Lochleven	Size							
South Boulder	Above Rollinsville	3500	80		4100			4	Annually	Distribute	Federal, Leadville	10,000 1½" rainbow to Nederland. Transport by	2		
		3500						2½	"	"	"	tank to North Boulder Pond.			
	Below Rollinsville	7000	80		8200			4	"	"	"	To Rollinsville. Distribute by F. S. tank.	4		
Jenny	Tributary, So. Boulder	380	60			1000		2	"	"	"	10000 1" rainbow to Boulder Fish & Game Assn.			
Middle Boulder	Above Nederland	2000	90		5400			2½	"	"	"	To Rollinsville, S. Boulder & E. Brook shipment.	2		
(Includes tributaries)															
	Lower Waters	3500	90		2400		2400	4	"	At junction N. Boulder	"	F. S. tank.	4		
												5000 1" rainbow to Boulder Fish & Game Assn. for	2		
												rearing to 4".			
North Boulder	Below Nederland. Ward Highway	3000	90		2700			6	"	Below highway	"	to N. Boulder: 7000 1½" rainbow to Nederland. Transport to site	2		
												by F. S. tank.			
South St. Vrain	Lower Waters	5500	90				7300	4	"	5 miles above Lyons	N. Boulder ponds	Original supply (15000) should be obtained from	3		
	Intermediate Waters	3000	75		9000			2	"	Above Confluence	Estes Park	Federal Hatchery at Leadville.			
	Upper Waters	3200	90	11000				2	"	Above Brainard Lake	Federal, Leadville	1/3 above Confluence, 1/3 at Nederland highway,	10		
												1/3 at Stapp Lake Road.			
Middle St. Vrain	Above Peaceful Valley	3000	75	22500				1½	"	Distribute through section	"	At Nederland and take to Brainard by tank.	2		
	Peaceful Valley to S. St. Vrain	8500	90		11500			4	"	"	"	At Lyons, transported to Peaceful Valley & trans-	10		
												ported to horses.			
North St. Vrain	10 miles below boundary	13000	80		15600			4	"	"	"	Original supply (20000) should be obtained from	5		
	Above Boundary	13000	80		31200			2½	"	"	"	State Hatchery at Estes Park.			
												To site.			
												To point where road leaves stream. Arrange for			
												pack horses to distribute.			
Big Thompson	Above Forks	13000	80		15600			4	"	"	"				
	Below Forks	8700	80				10500	4	"	"	"	To site and distribute.			
N. Fork Big Thompson	Above Forks	7000	80		8400			4	"	"	"	Federal, Leadville	10000 2" lochleven to Bennet Cr. Retaining Pond.		
Buckhorn	Tributary, Big Thompson	2300	60			5600		2	"	"	"	State, Estes Park	To Glen Haven.		
Cache La Poudre	Above Laramie. Poudre Tunnel	8700	80	70000				1½	"	Distribute through section	Federal, Leadville	To site and distribute.			
	Poudre Tunnel, Rustic	5700	50		11600			2	"	"	"	To F. S. tank at Ft. Collins, plant to Chambers,	5		
	Rustic, Road Tunnel	16800	50		12600			4	"	"	"	plant 25000 in Big S. Cache.			
	Below Road Tunnel	20000	50				15000	4	"	"	"	1000 every mile. Deliver to site.			
												20000 every 2 miles.			
South Poudre	Tributary, Poudre	48000	60		87000			2½	"	"	"	Federal, Leadville	To Ft. Collins, F. S. tank to Bennett pond,		
												20000 2" lochleven.			
												To Ft. Collins to F. S. tank. Plant 1/3 in head-	4		
												waters, plant 2/3 above and below Rockwell.			
												Arrange horses.			
Seven Mile		400	60			1000		2	"	"	"	headwaters	State	To site and distribute.	
Elkhorn		800	60			2000		2	"	"	"	"	"	"	
Sheep Creek	Tributary, Fk. Cache La Poudre	1200	60	3000				1½	"	"	"	Federal, Saratoga	To Stub Creek Ranger Station to F. S. tank.	4	
Roaring Fork	Tributary, Poudre	400	60	1500				1½	"	"	"	"	"	"	
North Poudre	Tributary, Poudre	7000	60		12000			2½	"	Distribute through section	"	Leadville	To Ft. Collins to F. S. tank. Plant in upper	4	
													waters.		
South Lone Pine	Tributary, N. Poudre	480	80			1400		2	"	"	"	State, Redfeather	Distribute		
North Lone Pine	"	700	80			2200		2	"	"	"	"	"	To site and distribute vicinity Columbine Creek	
													and as far below as possible.		
Deadman	Tributary, Big Laramie	480	60	1600				1½	"	"	"	headwaters	Federal, Saratoga	To Stub Creek Ranger Station.	
Nunn	Tributary, Upper Big Laramie	560	60	2000				1½	"	"	"	"	"	"	
Miller Fork	Above Falls, Trib. N. Fk. Thomp-	200	60			1000		2	"	"	"	State	To Glen Haven and arrange pack horse.		
	son														
Cabin		1100	60			2600		2	"	"	"	"	"	To site and distribute.	

FISH PLANTING PLAN FOR THE ROOSEVELT NATIONAL FOREST

LAKES

Name	Location	Capacity	Need %	Recommended Planting Plan				Remarks	Suggested Hatchery	Man
				B. Spotted	Rainbow	Eastern	Lochleven				Size:Frequency
				Native	Brook		of Plant			Cre
Echo		7800	20			6300:	:Every 3rd: :2 :year :Begin 1940 (43-46-49)	Federal - Leadville	:Deliver to Rollinsville with N. Boulder shipment--arrange at Tolland for horses	4
James Peak		7800	20			6300:	:Every 3rd: :2 :year :Begin 1940 (43-46-49)	"	:Deliver to Rollinsville--make plant at same time as Echo Lake	4
Heart Lake		10400	20	70000			:Every 4 : :1 1/2 :years :Begin 1939 (43-47)	"	:Deliver to Rollinsville--F. S. truck to E. Portal--arrange for horses	4
S. Boulder #1	:9 - 2S - 74W	9000	20	7000			:Every 4 : :1 1/2 :years :Begin 1939 (43-47)	"	" " " " " " " " " " " "	
S. Boulder #2	:8 - 2S - 74W	2000	20	4000			:Every 4 : :1 1/2 :years :Begin 1939 (43-47)	"	" " " " " " " " " " " "	
Crater #1	:4 - 2S - 74W	13000	100		10000:	:2 :Annual :2000 every yr. for 5 yrs:	"	"	" " " " " " " " " " " "	1
Crater #2	:4 & 9-2S-74W	20000	100		16000:	:2 :Annual :3000 " " " " " "	"	"	" " " " " " " " " " " "	1
Crater, Lower		10000	20		8000:	:Every 3 : :2 :years :Begin 1939 (42-45-48)	"	"	" " " " " " " " " " " "	2
Crater, Upper		10000	20	20000		:Every 2 : :1 1/2 :years :Begin 1940 (42-44-46)	"	"	" " " " " " " " " " " "	2
Arapaho		6500	100		5000:	:2 :Annual :1000 every yr. for 5 yrs:	"	"	" " " " " " " " " " " "	2
Forest #1	:34 - 1S - 74W	19500	20		15000:	:Every 3 : :2 :years :Begin 1939 (42-45-48)	"	"	" " " " " " " " " " " "	3
Forest #2	:33 - 1S - 74W	19500	20		15000:	:Every 3 : :2 :years :Begin 1939 (42-45-48)	"	"	" " " " " " " " " " " "	3
Jenny		6500	40		10000:	:Every 2 : :2 :years :Begin 1939 (41-43-45)	"	"	" " " " " " " " " " " "	2
Yankee Doodle		7000	40		11000:	:Every 2 : :2 :years :Begin 1939 (41-43-45)	"	"	:Deliver to Nederland--F. S. truck to end road--see Evans and Lilly at Eldora for horses	3
King		2600	20	5000		:Every 2 : :1 1/2 :years :Begin 1940 (42-43-44)	"	"	" " " " " " " " " " " "	3
Betty		6500	20	13000		:Every 2 : :1 1/2 :years :Begin 1940 (42-43-44)	"	"	" " " " " " " " " " " "	3
Cliff		2600	20	5000		:Every 2 : :1 1/2 :years :Begin 1940 (42-43-44)	"	"	" " " " " " " " " " " "	3
Lost		18000	75		53000:	:2 :Annual :Begin 1939	"	"	:Deliver to Nederland--F. S. truck to site	2
Woodland, Upper		13000	20	26000		:Every 2 : :1 1/2 :years :Begin 1940 (42-43-44)	"	"	:Deliver to Nederland--F. S. truck to end road--see Evans and Lilly at Eldora for horses	4
Woodland, Lower		13000	40		21000:	:Every 2 : :2 :years :Begin 1939 (41-43-45)	"	"	" " " " " " " " " " " "	
Jasper		10000	50		20000:	:Every 2 : :2 :years :Begin 1939 (41-43-45)	"	"	" " " " " " " " " " " "	
Thumb		1500	20	3000		:Every 3 : :1 1/2 :years :Begin 1940 (43-46-49)	"	"	" " " " " " " " " " " "	
Diamond		23000	40		37000:	:Every 3 : :2 :years :Begin 1940 (43-46-49)	"	"	" " " " " " " " " " " "	
Dorothy		2600	10		2000:	:Every 3 : :1 1/2 :years :Begin 1940 (43-46-49)	"	"	" " " " " " " " " " " "	
Brainard		2100	90		3000:	:4 :Annual :6000 1 1/2" to pond	"	"	:Obtain from N. Fork Boulder Pond--F. S. tank to site	
Long		6700	20		4000:	:2 1/2 :Annual :Begin 1939	"	"	:Deliver to Nederland--F. S. tank to Brainard--10 cans to Longs-- plant)	20
Isabelle		4000	0			:Planting not recommended:				
Mitchell		4800	20		4000:	:Every 2 : :2 :years :Begin 1939 (41-43-45)	"	"	" " " " " " " " " " " "	10
Blue (Above Mitchell)		5200	10	5000		:Every 3 : :1 1/2 :years :Begin 1940 (43-47-50)	"	"	" " " " " " " " " " " "	10
Rainbow		3300	70		4600:	:3 :Annual : :Every 3 : :1 1/2 :years :Begin 1940 (43-47-50)	:State - Estes Park	:Deliver to Rainbow Campground--CCC boys to plant--46 cans		20
Red Deer		1400	10	1400		:1 1/2 :years :Begin 1940 (43-47-50)	Federal - Leadville	:Deliver to Lyons--F. S. tank to Peaceful Valley		
Lily		4700	50		11500:	:2 :Annual :Begin 1939	:State - Estes Park	:Deliver to site and plant		

FISH PLANTING PLAN FOR THE ROOSEVELT NATIONAL FOREST (Continued)

LAKES

Name	Location	Capacity	Need %	Recommended Planting Plan				Remarks	Suggested Hatchery	
				B. Spotted: Native	Rainbow: Brook	Eastern: Lochleven	Size: Frequency: of Plant			
Hourglass		18700	20		15000	2 : Every 2	2 : years	:Begin 1939 (41-43)	:State - Estes Park	:Deliver to site and plant
Browns		3300	10		3300	1 1/2 : Every 4	1 1/2 : years	:Begin 1940 (44-48)	" " "	:Deliver to Bennett Ranch--arrange for horses
Comanche		650	20	1500		1 1/2 : Every 3	1 1/2 : years	:Begin 1939 (42-45)	" " "	" " " " " " "
Sheep Creek		25000	20		20000	2 : Every 3	2 : years	:Begin 1939 (42-45)	:Federal - Saratoga	:Deliver to Chambers Lake--F. S. tank to Sheep Cr.--arrange for horses
Mirror		1300	20		1000	2 : Every 2	2 : years	:Begin 1939 (42-45)	" "	:Deliver to Eggers--F. S. tank to Pingree Park--arrange for horses
Zimmerman		3300	20	6600		1 1/2 : Every 2	1 1/2 : years	:Begin 1940 (42-44)	" "	" " Chambers Lake--F. S. tank to Joe Wright Cr.--arrange for horses
Laramie		1300	40		2000	2 : Every 2	2 : years	:Begin 1939 (41-43-45)	" "	:Deliver to Chambers Lake--arrange for horses
Twin Lake (Above Laramie)					4000	2 : Every 2	2 : years	:Begin 1939 (41-43-45)	:Federal - Saratoga	" " " " " " "
Blue Lake	:34 - 8N - 76W		20		2000	2 : Every 2	2 : years	:Begin 1939 (41-43-45)	" "	" " " " " " "
Clark #1		4800							" "	
Clark #2		1300							" "	
Clark #3		650						:No policy is recom-	" "	
Clark #4		1300						:mended until survey	" "	
Clark #5		1300	20					:is made	" "	
Rawah #1		520	40		1000	2 : Every 2	2 : years	:Begin 1939 (41-43)	" "	
Rawah #2		2000	40		3000	2 : Every 2	2 : years	:Begin 1940 (42-44-46)	" "	
Rawah #3		25000	10		10000	2 : Every 3	2 : years	:Begin 1940 (43-45-49)	" "	
Rawah #4		4000	20		3000	2 : Every 3	2 : years	:Begin 1939 (42-45-48)	" "	:Deliver to Atmore Lodge--A. Moore has necessary horses
Rawah #5		1400	20		1000	2 : Every 3	2 : years	:Begin 1939 (42-45-48)	" "	
Rawah #6		650	20		500	2 : Every 3	2 : years	:Begin 1939 (42-45-48)	" "	
Rawah #7		1000	10					:No policy is recom-	" "	
Camp #1		6500	20		5000	2 : Every 2	2 : years	:Begin 1939 (41-43-45)	" "	
Camp #2		10000	10		4800	2 : Every 2	2 : years	:Begin 1939 (41-43-45)	" "	
McIntyre #1		4800	20		4000	2 : Every 2	2 : years	:Begin 1939 (41-43-45)	" "	
McIntyre #2		3200						:No policy is recom-	" "	
McIntyre #3		2600						:mended now	" "	
Creedmore #1		17000	10		2500	4 : Every	4 : year	:Low policy specified on	:Colorado - State	:Deliver to site and plant--begin 1939
Creedmore #2		14000	10					:account of low oxygen	" "	" " " " " "
Creedmore #3		14000	10					:content	" "	" " " " " "
Dowdy		56000	5		4200	4 : Every	4 : year	:Same policy factors as	" "	" " " " " "
West		14000	5		1000	4 : Every	4 : year	:Creedmore Lakes	" "	" " " " " "
Bellaire		7800	5		900	4 : Every	4 : year		" "	" " " " " "

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery Federal - LeadvilleSupervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or Name of Lake	Area of Lake : or Stream	Degree: Fished:	Species: Required:	Allotment: Number:	Size:	Notify	Name and Address of Party to Receive Fish	Point of: Delivery:	Date to be Requisitioned
Name of Lake	Length:	Width :	:	:	:	:	Name	Address :	:
So. Boulder above:	For planting in:	:	:	:	:	:	:	:	Rollins-:
Rollinsville	N.Boulder Ponds:	:	Rainbow	10000:	1 $\frac{1}{2}$	Forest Ranger:	:	ville	:1939-1940-1941
Crater Lake	:	:	:	:	:	:	:	:	Rollins-:
(Lower)	:	:	Rainbow	8000:	2	Forest Ranger:	:	ville	:1939-42-45-48
Arapaho Lake	:	:	:	:	:	:	:	:	Rollins-:
	:	:	Rainbow	5000:	2	Forest Ranger:	:	ville	:1939-40-41-42
Crater Lake #1	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	2000:	2	Forest Ranger:	:	ville	:1939-40-41-42-43
Crater Lake #2	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	3000:	2	Forest Ranger:	:	ville	:1939-40-41-42-43
Forest Lake #1	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	15000:	2	Forest Ranger:	:	ville	:1939-42-45-48
Forest Lake #2	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	15000:	2	Forest Ranger:	:	ville	:1939-42-45-48
Jenny Lake	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	10000:	2	Forest Ranger:	:	ville	:1939-41-43-45
Yankee Doodle	:	:	:	:	:	:	:	:	Rollins-:
Lake	:	:	E. Brook:	11000:	2	Forest Ranger:	:	ville	:1939-41-43-45
Echo Lake	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	6300:	2	Forest Ranger:	:	ville	:1940-43-46-49
James Peak Lake:	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	6300:	2	Forest Ranger:	:	ville	:1940-43-46-49
Jenny Creek	:	:	:	:	:	:	:	:	Rollins-:
	:	:	E. Brook:	1000:	2	Forest Ranger:	:	ville	:1939-40-41-42

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery Federal - LeadvilleSupervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or Name of Lake	Area of Lake : or Stream :Length:Width	Degree: Fished:	Species: Required:	Allotment: Number:Size:	Notify	Name and Address of Party to Receive Fish:	Point of: Delivery:	Date to be Requisitioned
						Name	Address	
Heart Lake	:	:	:Black	:	:	:	:Rollins-	:
S. Boulder	:	:	:Spotted	: 70000: 1½	:Forest Ranger:	:	:ville	:1939-43-47-51
Lake #1	:	:	:Spotted	: 7000: 1½	:Forest Ranger:	:	:ville	:1939-43-47-51
S. Boulder	:	:	:Black	:	:	:	:Rollins-	:
Lake #2	:	:	:Spotted	: 4000: 1½	:Forest Ranger:	:	:ville	:1939-43-47-51
Crater Lake	:	:	:Black	:	:	:	:Rollins-	:
(Upper)	:	:	:Spotted	: 20000: 1½	:Forest Ranger:	:	:ville	:1940-42-44-46
S. St. Vrain	:	:	:Black	:	:	:	:Neder-	:
(Upper waters)	:	:	:Spotted	: 11000: 2	:Forest Ranger:	:	:land	:1939-40-41-42
M. Boulder Cr.	:	:	:	:	:	:	:Neder-	:
Above Nederland:	:	:	:Rainbow	: 5400: 2½	:Forest Ranger:	:	:land	:1939-40-41-42
N. Boulder Cr. For planting inN:	:	:	:	:	:	:	:Neder-	:
Below Ward Hwy.:Boulder Ponds	:	:	:Rainbow	: 7000: 1½	:Forest Ranger:	:	:land	:1939-40-41-42
:	:	:	:Black	:	:	:	:Neder-	:
King Lake	:	:	:Spotted	: 5000: 1½	:Forest Ranger:	:	:land	:1940-42-44-46
:	:	:	:Black	:	:	:	:Neder-	:
Betty Lake	:	:	:Spotted	: 13000: 1½	:Forest Ranger:	:	:land	:1940-42-44-46
:	:	:	:Black	:	:	:	:Neder-	:
Cliff Lake	:	:	:Spotted	: 5000: 1½	:Forest Ranger:	:	:land	:1940-42-44-46
:	:	:	:	:	:	:	:Neder-	:
Lost Lake	:	:	:E. Brook:	: 53000: 2	:Forest Ranger:	:	:land	:1939-40-41-42

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery Federal - LeadvilleSupervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or Name of Lake	Area of Lake : or Stream	: Degree: Fished:	Species Required:	: Allotment Number:	: Size: Size:	Notify	: Name and Address of Party to Receive Fish:	: Point of: Delivery:	Date to be Requisitioned
Name of Lake	: Length:	Width :	:	:	:	:	Name	: Address :	:
Woodland Lake (Upper)	:	:	:	: Black :	:	:	:	: Neder- :	:
	:	:	:	: Spotted :	26000:	1½ :	Forest Ranger:	:	: land :1940-42-44-46
Woodland Lake (Lower)	:	:	:	: E. Brook:	21000:	2 :	Forest Ranger:	:	: land :1939-41-43-45
	:	:	:	:	:	:	:	: Neder- :	:
Jasper Lake	:	:	:	: E. Brook:	20000:	2 :	Forest Ranger:	:	: land :1939-41-43-45
	:	:	:	: Black :	:	:	:	: Neder- :	:
Thumb Lake	:	:	:	: Spotted :	3000:	1½ :	Forest Ranger:	:	: land :1940-43-46-49
	:	:	:	:	:	:	:	: Neder- :	:
Diamond Lake	:	:	:	: E. Brook:	37000:	2 :	Forest Ranger:	:	: land :1940-43-46-49
	:	:	:	:	:	:	:	: Neder- :	:
Dorothy Lake	:	:	:	: E. Brook:	2000:	1½ :	Forest Ranger:	:	: land :1940-43-46-49
	: To be planted in N.:	:	:	:	:	:	:	: Neder- :	:
Brainard Lake	: Boulder Pond :	:	:	: Rainbow :	6000:	1½ :	Forest Ranger:	:	: land :1939-40-41-42
	:	:	:	:	:	:	:	: Neder- :	:
Long Lake	:	:	:	: E. Brook:	4000:	2½ :	Forest Ranger:	:	: land :1939-40-41-42
	:	:	:	:	:	:	:	: Neder- :	:
Mitchell Lake	:	:	:	: E. Brook:	4000:	2 :	Forest Ranger:	:	: land :1939-41-43-45
	:	:	:	: Black :	:	:	:	: Neder- :	:
Blue Lake	:	:	:	: Spotted :	5000:	1½ :	Forest Ranger:	:	: land :1940-43-47-50
S. St. Vrain (Lower waters)	: To be planted in : : N. Boulder Pond:	:	:	: Loch- : eleven :	:	:	:	: Neder- :	:
		:	:	: 15000:	1½ :	Forest Ranger:	:	: land :1939-40-41-42	

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery Federal - LeadvilleSupervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or Name of Lake	Area of Lake : or Stream	Degree: Fished:	Species: Required:	Allotment: Number:	Size: Size:	Notify	Name and Address of Party to Receive Fish	Point of: Delivery:	Date to be Requisitioned
Name of Lake	Length:	Width :	:	:	:	:	Name :	Address :	:
Poudre River (Upper Waters)	:	:	:	:Black	:	:	:	:Fort	:
Poudre River (Lower Waters)	To be planted in Bennett Cr. Pond	:	:	:Spotted	: 70000:	1½	:Forest Super.:	:	:Collins :1939-40-41-42
Big Thompson (Lower Waters)	:	:	:	:Loch-	:	:	:	:Fort	:
	:	:	:	:leven	: 20000:	2	:Forest Super.:	:	:Collins :1939-40-41-42
	:	:	:	:Loch-	:	:	:	:Fort	:
	:	:	:	:leven	: 15000:	2	:Forest Super.:	:	:Collins :1939-40-41-42
N. Poudre	:	:	:	:Rainbow	: 12000:	1½	:Forest Super.:	:	:Collins :1939-40-41-42
S. Poudre	:	:	:	:Rainbow	: 87000:	2½	:Forest Super.:	:	:Collins :1939-40-41-42
M. St. Vrain (Upper Waters)	:	:	:	:Black	:	:	:	:	:
	:	:	:	:Spotted	: 22500:	1½	:Forest Super.:	:	:Lyons :1939-40-41-42
Red Deer Lake	:	:	:	:Black	:	:	:	:	:
	:	:	:	:Spotted	: 1400:	1½	:Forest Super.:	:	:Lyons :1940-43-47-50
S. Boulder (Be- low Rollinsville)	:	:	:	:	:	:	:Secretary, :Club	:Boulder Fish & Game :Association	:
M. Boulder (Lower Waters)	:	:	:	:Rainbow	: 10000:	1½	:Club	:Boulder	:1939-40-41-42
	:	:	:	:	:	:	:Secretary, :Club	:Boulder Fish & Game :Association	:
	:	:	:	:Rainbow	: 5000:	1½	:Club	:Boulder	:1939-40-41-42

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery Federal - Saratoga

Supervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or Name of Lake	Area of Lake : or Stream	Degree: Fished:	Species: Required:	Allotment: Number:	Size: :	Notify	Name and Address of : Party to Receive Fish:	Point of: Delivery:	Date to be Requisitioned
Name of Lake	Length:	Width:	:	:	:	:	Name	Address:	:
Mirror Lake	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Rawah Lake #1	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Rawah Lake #2	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Rawah Lake #3	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Rawah Lake #4	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Rawah Lake #5	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Rawah Lake #6	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Camp Lake #1	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Camp Lake #2	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
McIntyre Lake	:	:	:	:	:	:	:	:	:
#1	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:
Laramie Lake	:	:	:	:	:	:	:	:	:

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery Federal - SaratogaSupervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or	Area of Lake or Stream	Degree: Fished:	Species: Required:	Allotment: Number:	Size: Size:	Notify	Name and Address of Party to Receive Fish:	Point of: Delivery:	Date to be Requisitioned
Name of Lake	Length:	Width	:	:	:	:	Name	Address	:
Blue Lake	:	:	:	:	:	:	:	:	Chambers:
34-8 N-76 W	:	:	:	E. Brook:	2000: 2	Forest Super.:	:	Lake	:1939-41-43-45
Twin Lake(Above:	:	:	:	:	:	:	:	Chambers:	:
Laramie Lake)	:	:	:	E. Brook:	2000: 2	Forest Super.:	:	Lake	:1939-41-43-45
:	:	:	:	:	:	:	:	Chambers:	:
Sheep Cr. Lake	:	:	:	E. Brook:	20000: 2	Forest Super.:	:	Lake	:1939-42-45-48
:	:	:	:	Black	:	:	:	Chambers:	:
Zimmerman Lake	:	:	:	Spotted	: 6600: 1 $\frac{1}{2}$	Forest Super.:	:	Lake	:1940-42-44-46
:	:	:	:	Black	:	Forest Ranger:	:	Stub Cr.:	:
Deadman Creek	:	:	:	Spotted	: 1600: 1 $\frac{1}{2}$	Redfeather	:	R. S.	:1939-40-41-42
:	:	:	:	Black	:	Forest Ranger:	:	Stub Cr.:	:
Nunn Creek	:	:	:	Spotted	: 2000: 1 $\frac{1}{2}$	Redfeather	:	R. S.	:1939-40-41-42
:	:	:	:	Black	:	Forest Ranger:	:	Stub Cr.:	:
Sheep Creek	:	:	:	Spotted	: 3000: 1 $\frac{1}{2}$	Redfeather	:	R. S.	:1939-40-41-42
:	:	:	:	Black	:	Forest Ranger:	:	Stub Cr.:	:
Roaring Fork	:	:	:	Spotted	: 1500: 1 $\frac{1}{2}$	Redfeather	:	R. S.	:1939-40-41-42

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery State - Estes ParkSupervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or Name of Lake	Area of Lake : or Stream	Degree: Fished:	Species: Required:	Allotment: Number:	Size: Notify	Name and Address of : Party to Receive Fish	Point of: Delivery:	Date to be Requisitioned
Name of Lake	Length:	Width:	:	:	:	Name	Address	:
M. St. Vrain (Int. Waters)	To be planted in: N. Boulder Pond:	:	: Rainbow :	20000:	1 $\frac{1}{2}$: Forest Super.:	:	: Site :	: 1939-40-41-42
S. St. Vrain (Int. Waters)	:	:	: Rainbow :	9000:	2 : Forest Super.:	:	: Stream :	: 1939-40-41-42
N. Fk. Big Thomp- son (Above Fks.)	:	:	: Rainbow :	8400:	4 : Forest Super.:	:	: Glen- haven :	: 1939-40-41-42
N. St. Vrain (Be- low boundary)	:	:	: Rainbow :	15600:	4 : Forest Super.:	:	: At Stream :	: 1939-40-41-42
N. St. Vrain (A- bove boundary)	:	:	: Rainbow :	31000:	2 $\frac{1}{2}$: Forest Super.:	:	: Where rd. leaves stream :	: 1939-40-41-42
Buckhorn Creek	:	:	: E. Brook:	5600:	2 : Forest Super.:	:	: At Stream :	: 1939-40-41-42
Lily Lake	:	:	: E. Brook:	11500:	2 : Forest Super.:	:	: At Stream :	: 1939-40-41-42
Hourglass Lake	:	:	: E. Brook:	15000:	2 : Forest Super.:	:	: At Stream :	: 1939-40-41-42
Browns Lake	:	:	: Rainbow :	3300:	1 $\frac{1}{2}$: Forest Super.:	:	: Bennett Ranch :	: 1940-44-48-52
Comanche	:	:	: Black Spotted :	1500:	1 $\frac{1}{2}$: Forest Super.:	:	: Bennett Ranch :	: 1939-42-45-48
Rainbow Lakes	:	:	: E. Brook:	4600:	4 : Forest Super.:	:	: Camp- ground :	: 1939-40-41-42

Name of Forest Roosevelt

U. S. FOREST SERVICE

Suggested Hatchery State - RedfeatherSupervisor Wm. Kreutzer

REQUISITION FOR FISH

Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section: of Stream or Name of Lake	Area of Lake or Stream	Degree: Fished	Species: Required	Allotment: Number	Size: Size	Notify	Name and Address of Party to Receive Fish	Point of: Delivery	Date to be Requisitioned
Name of Lake	Length	Width	:	:	:	:	Name	Address	:
N. Lone Pine Cr.	:	:	:	:	:	:Redfeather	:	:At	:
	:	:	:	:	:	:Forest Ranger:	:	:Stream	:1939-40-41-42
S. Lone Pine Cr.	:	:	:	:	:	:Refeather	:	:At	:
	:	:	:	:	:	:Forest Ranger:	:	:Stream	:1939-40-41-42
Creedmoor Lake	:	:	:	:	:	:Redfeather	:	:	:
	:	:	:	:	:	:Forest Ranger:	:	:Lake	:1939-40-41-42
Twin Lakes(West):	:	:	:	:	:	:Redfeather	:	:	:
	:	:	:	:	:	:Forest Ranger:	:	:Lake	:1939-40-41-42
Dowdy Lake	:	:	:	:	:	:Redfeather	:	:	:
	:	:	:	:	:	:Forest Ranger:	:	:Lake	:1939-40-41-42
Bellaire Lake	:	:	:	:	:	:Redfeather	:	:	:
	:	:	:	:	:	:Forest Ranger:	:	:Lake	:1939-40-41-42

Name of Forest Roosevelt

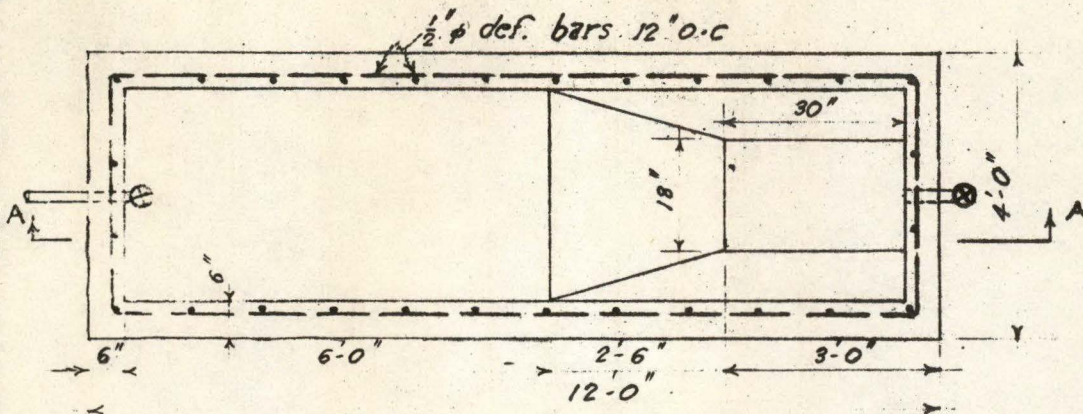
U. S. FOREST SERVICE

Suggested Hatchery State - Bellevue
or other (Perhaps
Estes Park)Supervisor Wm. Kreutzer

REQUISITION FOR FISH

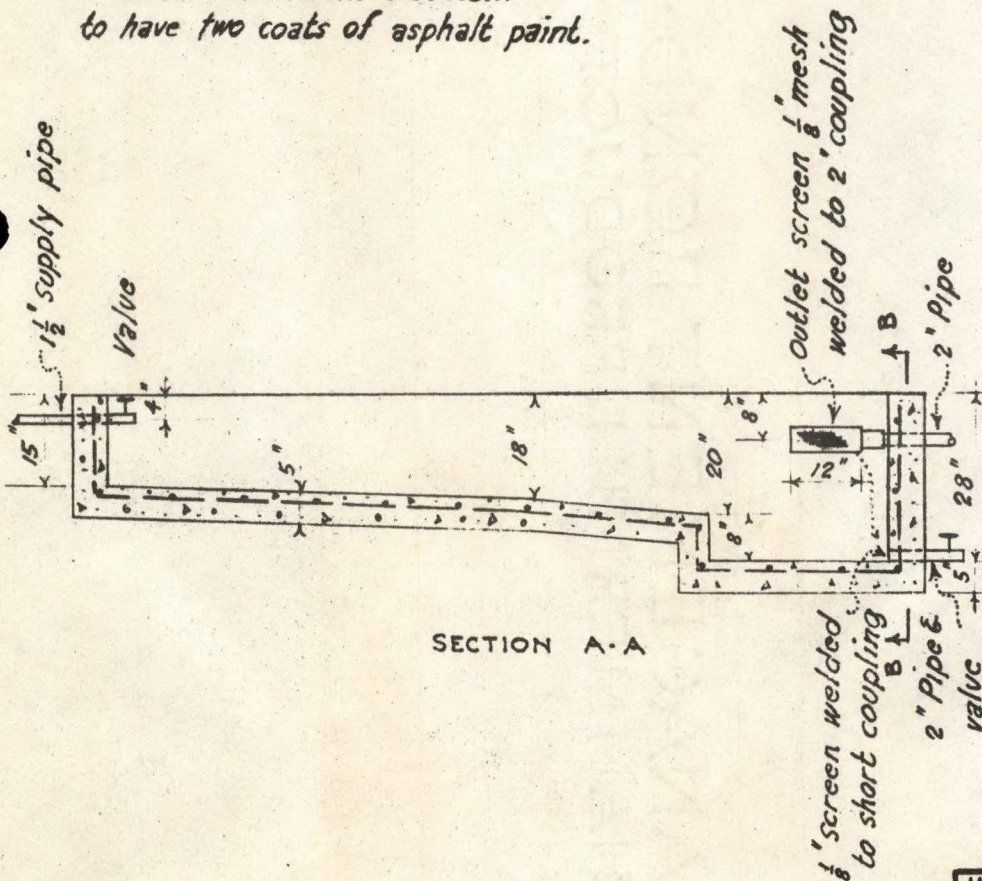
Address Fort Collins, ColoradoYear GeneralTelegraph Address " "

Name & Section:	Area of Lake	Degree:	Species:	Allotment :		Name and Address of	Point of:	Date to be
of Stream or	or Stream	Fished:	Required:	Number:	Size:	Notify	Party to Receive Fish:	Delivery:
Name of Lake	Length:	Width :	:	:	:	:	Name	Address :
Poudre River	:	:	:	:	:	:	:	At
Rustic	:	:	:Rainbow	: 11600:	2	:Forest Super.:	:	:Stream :1939-40-41-42
Road Tunnel	:	:	:Rainbow	: 12600:	4	:Forest Super.:	:	:Stream :1939-40-41-42
Sevenmile Creek:	:	:	:E. Brook:	1000:	2	:Forest Super.:	:	:Stream :1939-40-41-42
Elkhorn Creek	:	:	:E. Brook:	2000:	2	:Forest Super.:	:	:Stream :1939-40-41-42
Miller Fork	:	:	:E. Brook:	1000:	2	:Forest Super.:	:	:Stream :1939-40-41-42
Cabin Creek	:	:	:E. Brook:	2600:	2	:Forest Super.:	:	:Stream :1939-40-41-42

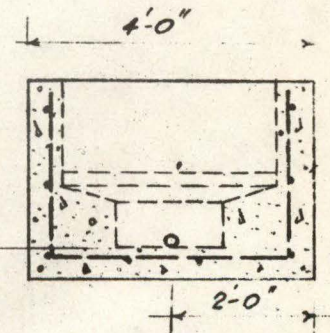


PLAN

Note: Inside walls & bottom
to have two coats of asphalt paint.



SECTION A-A



SECTION B-B

1 1/2 0 1 2 3 FT.

Scale

U. S. DEPARTMENT OF AGRICULTURE			
FOREST SERVICE			
REGION 2 JAMES L. DOWDALL REGIONAL ENGINEER			
FISH HOLDING POND			
DESIGNED C.N.F.	DRAWN W.H.S.	TRACED W.H.S.	
SCALE		CHECKED C.N.F.	
APPROVED J.L.B.		DATE 11-28-38	